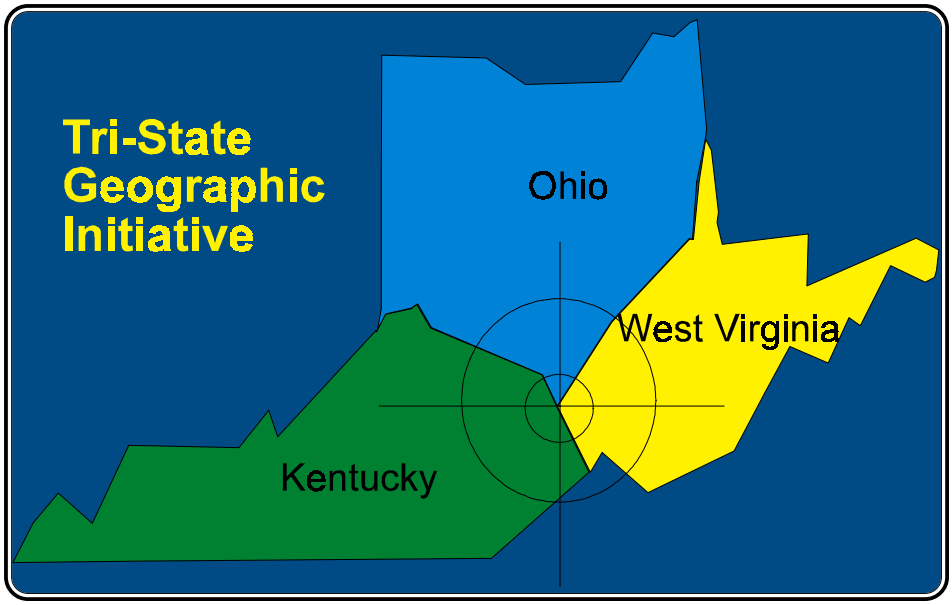

FINAL

TRI-STATE GEOGRAPHIC INITIATIVE
KENOVA INDUSTRIAL CLUSTER COMPARISON REPORT OF AIR MONITORING & AIR MODELING RISK ASSESSMENTS

EPA Region 3 P.O. Number OP-3016-NTLX

Gannett Fleming Project Number 38121

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LIST OF ACRONYMS

µg	micrograms
ACGIH	American Conference of Governmental Industrial Hygienists
AEGLs	Acute Emergency Guidance Levels
AIHA	American Industrial Hygiene Association
ASTM	American Society of Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
Cal EPA	California Environmental Protection Agency
Cal RELs	California Reference Exposure Levels
CAPCOA	California Air Pollution Control Officers Association
CDC	Centers for Disease Control and Prevention
CEELs	Community Emergency Exposure Levels
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COPC	Contaminants of Potential Concern
COT	Committee on Toxicology
CPS	Carcinogenic Potency Slope
CSF	Cancer Slope Factor
DOE	Department of Energy
EEGLs	Emergency Exposure Guidance Levels
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
ERPGs	Emergency Response Planning Guidelines
ft	feet
GF	Gannett Fleming
GIS	Geographic Information System
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
IDLH	Immediately Dangerous to Life and Health Values
ILCR	Incremental Life Time Cancer Risk
IRIS	Integrated Risk Information System
kg	kilogram
L	liter
LD_{50}	Dose that is lethal to 50% of the test organisms
LC_{50}	Concentration that is lethal to 50% of the test organisms
LOAEL	Lowest Observed Adverse Effect Level
MCLs	Maximum Contaminant Levels
MEI	Maximally Exposed Individual
mg	milligrams
MRLs	Minimum Risk Levels

NAS	National Academy of Science
NIOSH	National Institute for Occupational Safety and Health
NOAEL	No Observed Adverse Effect Level
NRC	National Research Council
NCEA	National Center for Environmental Assessment
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PAHs	Polynuclear Aromatic Hydrocarbons
PELs	Permissible Exposure Levels
ppm	parts per million
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RELs	Reference Exposure Levels
RfC	Reference Concentration
RfD	Reference Dose
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIC	Standard Industrial Classification
SLERA	Screening Level Ecological Risk Assessment
SOP	Standard Operating Procedure
SPEGLs	Short-term Public Emergency Guidance Levels
STELs	Short-Term Exposure Limits
SVOC	Semivolatile Organic Compound
TEELs	Temporary Emergency Exposure Limits
TGI	Tri-State Geographic Initiative
TLVs	Threshold Limit Values
TLV-C	Threshold Limit Value - Ceiling
TRI	Toxic Release Inventory
TWA	Time Weighted Average
UCL	Upper Confidence Limit
URF	Unit Risk Factor
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound

1.0 INTRODUCTION

In 1991, Kentucky, West Virginia, Ohio and the United States Environmental Protection Agency (USEPA) Regions 3, 4, and 5 formed a partnership to study the 2,300 square mile area where the three states converge. The mission of the partnership was to ascertain the environmental status in this Tri-State area and to develop and implement a plan to respond to any problems identified with existing authorities. The partners called this mission the Tri-State Multi-Media Geographic Initiative (now known as The Tri-State Geographic Initiative or TGI).

During project planning, air quality emerged as the top priority. The Initiative's Technical Steering Committee established the Air Toxics Project. Study of the Tristate area's air quality was conceived to consist of three components: air monitoring, air dispersion modeling, and assessment of the risks associated with any pollutants found during the monitoring and modeling.

The TGI Air Toxics Project is being conducted in several phases due to the extensive size of the study area, the available resources, and the need to provide adequate monitor coverage for each individual area. Six industrial "clusters" have been identified based on the spatial distribution of industries within the project area. As discussed in the Tri-State Geographic Initiative *Air Toxics Project- Work Plan*s (TGI 1997a, b, and c), the six clusters were prioritized based on the results of a preliminary risk screening effort. During this effort, the Kenova Industrial Cluster was identified as the cluster of greatest concern for potential risks resulting from air exposures. Therefore, the initial evaluations have focused on the Kenova Industrial Cluster.

In support of the TGI Air Toxics Project, two risk assessments were performed to evaluate the potential risks to the population of the Kenova Industrial Cluster from exposure to airborne contaminants. This report presents a comparison of the results of the human health risk assessments for both chronic and acute effects evaluations performed using the air monitoring data and air modeling data developed for the Kenova Industrial Cluster during the 1996 and 1997 time period. Both risk assessments focused on direct exposure to airborne contaminants through

the inhalation pathway. Risk evaluations of the results of air monitoring program are presented in the *Tri-State Geographic Initiative Kenova Industrial Cluster Air Monitoring Risk Assessment Report* (USEPA 2000a). Risk evaluations of the results of air dispersion modeling project are presented in the *Tri-State Geographic Initiative Kenova Industrial Cluster Air Modeling Risk Assessment Report* (USEPA 2000b).

1.1 REPORT ORGANIZATION

This report is organized into six chapters. This Introduction is Chapter 1.0 which includes an overview of the study area. Chapter 2.0, Comparison of the Chronic Air Monitoring and Air Modeling Risk Assessments presents a comparison of the methodology and results of the quantitative, chronic human health risk assessments. Chapter 3.0, Comparison of the Air Monitoring and Air Modeling Acute Effects Evaluation, presents a comparison of the methodology and results of the screening-level evaluation of potential acute human health effects from short-term exposure to airborne contaminants using the air monitoring and air modeling data. Chapter 4.0 presents a discussion of the comparisons, and Chapter 5.0 presents the conclusions to this report. References are summarized in Chapter 6.0.

1.2 GOALS AND OBJECTIVES

The objective of this report for the Tri-State Geographic Initiative is to provide a comparison of the results of the quantitative estimate of risk posed to human health which were developed separately based on air monitoring and air modeling conducted for the Kenova Industrial Cluster portion of the TGI study area (see USEPA 2000a and USEPA 2000b). Both assessments provide estimates of risk to human health through direct exposure (i.e. via inhalation) to target air pollutants. A further goal of both studies involved (to the extent possible) quantitative evaluation of acute risks to human health from exposure to airborne contaminants.

The risk assessments used information from ambient air quality monitoring and air modeling described in other work plans (TGI 1997a, b, and c). The goal of the risk assessments is to provide information on risk that the Federal, State, local governments and other stakeholders can utilize in sound decision-making.

1.3 BACKGROUND INFORMATION

1.3.1 General Geographic Description

The Tri-State study area is located where the states of Kentucky, Ohio, and West Virginia meet. The area is located at the confluence of the Ohio and Big Sandy Rivers with a typical river valley topography that strongly influences the meteorology of the area (TGI 1997a). Generally calm wind conditions limit the distribution and dilution of pollutants in the atmosphere (TGI 1997a).

1.3.2 Study Area Description

The Tri-State area encompasses six counties in the Ohio River valley, specifically, Greenup and Boyd counties in Kentucky; Lawrence and Scioto counties in Ohio, and Wayne and Cabell counties in West Virginia. Six industrial clusters have been identified in the Tri-State area; these are the Portsmouth, Greenup, Ironton, South Point, Kenova and Huntington Clusters (TGI 199a; See Figure 1-1). The study area for this comparison report is the Kenova Industrial Cluster.

1.3.3 Previous Investigations

Ambient air has been identified as a medium of concern in the TGI study area by state and federal agencies, and by local citizens (TGI 1997c). Concerns over air quality have arisen because of the significant number of industrial accidents involving air releases of hazardous air pollutants, the meteorology of the area, the amount of air emissions reported to the Toxic Release Inventory (TRI) by area industries, relative to emissions to other media, and number and

frequency of air quality-related complaints by the citizens of the area. Tri-State area citizens have expressed more concern about air pollution than about other environmental issues (TGI 1997c). Between 1983 and 1988, regulatory agencies received more than 800 air-related complaints from citizens in the Tri-State area (TGI 1997a).

Previous investigations into air quality concerns have included an epidemiological study (USEPA Region 4 1992), a survey of citizen's air quality-related concerns (USEPA 1989c), and an air quality study that focused on historic air monitoring data (USEPA 1990c). Results from these studies indicated that air emissions from a variety of sources have occurred in the Tri-State area over many years and that health-related effects may have resulted from exposure to the air emissions in the Tri-State area.

1.3.4 Land Use

Population and industry in the study area are concentrated in two river valleys: the Lower Ohio River Valley and the Big Sandy River Valley. High intensity development such as heavy industry is approximately 11% of the Lower Ohio River Valley while high intensity development is approximately 1% in the Big Sandy River Valley (TGI 1997a). A number of heavy industries are located within the study area, and generally within the river valleys. Many of these industries date back prior to World War II. These industries are predominately metallurgical or petrochemical in nature (TGI 1997a). Example industries in Wayne County West Virginia are Aristech Chemical Corporation and Ashland Chemical Incorporated. Ashland Petroleum Corporation and Calgon Corporation are example industries in Boyd County Kentucky. Emissions from these four industries were used in the air modeling study for the Kenova Industrial Cluster (USEPA Region 5, 2000).

Low intensity development, which includes single-family home residential land use, comprises 16% of the Lower Ohio River Valley and 2% of the Big Sandy River Valley. The percentage of agricultural land uses in the Kenova Industrial Cluster ranges from 4 to 17%. Natural landscapes

include wetland and forested areas. Approximately 6% of the Lower Ohio River Valley is wetland while only approximately 2% of the Big Sandy River Valley is wetland. Forested areas comprise approximately 5% of the Lower Ohio River Valley and approximately 77% of the Big Sandy River Valley (TGI 1997a).

The major population centers within the TGI study area are Ashland, KY; Huntington, WV; and Ironton, OH. Other towns of significant interest to the study include Catlettsburg, KY; Kenova and Ceredo, WV; and South Point, OH (TGI 1997a).

2.0 COMPARISON OF CHRONIC RISK ASSESSMENT RESULTS

2.1 METHODOLOGIES USED TO DEVELOP AIR MONITORING RISKS AND AIR MODELING RISKS

2.1.1 Data Collection– Air Monitoring

Data included in the air monitoring risk assessment were collected by the USEPA and the State of Kentucky. As discussed in TGI's *Air Toxics Monitoring Project Plan* (TGI 1997a), air samples were analyzed for volatile organic compounds (VOCs) and acidic and basic gases by Kentucky's Environmental Services Division, for semivolatile organic compounds (SVOCs) by contract laboratories to Kentucky's Environmental Services Division, and for metals by the West Virginia Office of Air Quality. Data from the labs were summarized into electronic forms as discussed in TGI (1997a), and provided to the risk assessment group (TGI 1997c). Hard copies of all sample and analysis forms are being maintained at the Kentucky Division for Air Quality office in Frankfort, Kentucky (TGI 1997a). Data used in this risk assessment are presented in Appendix A of USEPA (2000a).

Data were collected from six stationary monitoring locations in the Kenova Industrial Cluster plus one additional stationary monitoring location near Webbville, Kentucky. The Webbville, Kentucky location was considered to be in a different "air-shed" and was thought to represent ambient air conditions in the general surroundings, but which were not impacted by Kenova Industrial Cluster emissions. The sampling locations were chosen based on preliminary air dispersion modeling results of emissions and on the locations of population centers. Criteria used in selecting monitoring locations are detailed in the Air Toxics Monitoring Project Plan (TGI 1997a). It is important to note that the monitoring analysis collects any chemicals present in air at the time of sampling. These chemicals may be from local sources such as large industries, small businesses, and cars and trucks. The monitors will also collect any chemicals in air that has been transported into the area from a different location. In contrast, the modeling

effort (described below) was focused only a subset of possible emissions from four specific industries in the Kenova Industrial Cluster. As such the modeling effort did not provide estimates of chemical concentrations resulting from any of these possible sources (e.g., small businesses, mobile sources, or chemicals transported from outside of the area).

Sampling locations are identified on Figure 1-2 and were entitled Centennial Drive, Corn Field, Kenova Fire Station, Kenova Water Works, Lockwood Estates, and Sweet Run based on the general vicinity in which the sampler was located. Air monitors were located two meters above ground level, a height selected to be representative of human exposure. Air sampling from stationary samplers was conducted over a 24-hour period. Chemical concentrations, therefore, represented daily averages. Samples at stationary sampler locations were taken approximately every 12 days. Triggered air samples were taken at the Kenova Fire Station site (this sampling device was activated by a relatively high concentration of volatiles; however, once activated, the device continued to sample for 2hours before shutting down).

In addition to samples collected by the stationary samplers, the State of Kentucky mobile lab was also used in the air monitoring study. Mobile lab samples were taken at three of the stationary sampler locations: the Corn Field study area, the Kenova Fire Station, and the Kenova Water Works. An additional mobile lab sampling point was located at the South Point Ethanol facility. A gas chromatograph/mass spectrometer was deployed to conduct real-time continuous VOC sampling. Air sampling using the mobile laboratory was conducted by Kentucky's Environmental Services Division. All sampling and analysis procedures were conducted in accordance with the Kentucky Division for Air Quality's quality assurance program, as published in the Division's *Air Quality Monitoring and Quality Assurance Manual* (State of Kentucky, Division of Air Quality 1995). Sampling periods and locations were selected by the Kentucky Environmental Services Division. Air sampling from the State of Kentucky mobile laboratory was conducted hourly. Chemical concentrations, therefore, represent hourly averages. Samples taken at each location are summarized in Table 2-1. This table presents the types of analytes sampled at each location, the sampling duration (e.g., one hour versus 24 hour) and

whether samples were used in the chronic risk analysis, acute risk analysis or both. Table 2-2 summarizes the chemicals analyzed for in each type of sample collector.

2.1.2 Data Collection– Kenova Industrial Cluster Air Modeling

A contractor to USEPA conducted refined meteorological and non-steady-state air quality dispersion modeling to evaluate the air quality impacts of toxic air pollutants from the Kenova Industrial Cluster. Emissions from four facilities, the Ashland Petroleum Company, the Ashland Chemical Company, the Aristech Chemical Company, and the Calgon Carbon Corporation were considered in the modeling. The list of chemicals modeled was based on the facilities' TRI reports, which the Initiative confirmed during meetings with the industries. All of the chemicals in the facilities' air emissions were modeled, except any USEPA "criteria pollutants" (ozone, carbon monoxide, nitrogen oxides, sulfur dioxide, particulate matter, and lead). The criteria pollutants are already monitored and regulated by USEPA and the States. A list of the model chemicals is provided in Table 2-3.

2.1.2.1 Description of the Model

The modeling effort ran both CALMET and CALPUFF air modeling programs for a full-year period for these four sources in the Kenova Industrial Cluster. There were three distinct tasks to the modeling:

1.) TASK 1 used the maximum emission rate for each source at each facility throughout the year. Three of the four modeled facilities provided this information. However, Ashland Petroleum provided only one set of emission data reflecting a typical day's emissions. As such, the TASK 1 modeling includes a mixture of maximum emissions estimates from Aristec, Calgon, and Ashland Chemical, but only typical daily emissions estimates from Ashland Petroleum.

2.) TASK 2 used variable daily emissions (when available) for each source at each facility over ten distinct short-tern episode periods.

3.) TASK 3 used variable daily emissions (when available) for each source at each facility for the entire modeling period, i.e. a whole year.

The latest versions of the CALMET (version 5.0, level 990228), and CALPUFF (version 5.0, level 990228a) non- steady state models (Scire et al 1998a, b) were used for the modeling analysis.

Among the four modeled facilities, there were a total of 116 point sources, 88 area sources and 1 volume source. Ashland Petroleum was responsible for 89 point sources and 82 area sources, with the remaining sources originating from the other 3 facilities. These source areas represented the chemical data input into the modeling.

A total of 4022 discrete points (receptors) were modeled on a standard grid (the modeling domain). In addition to the receptor locations on the standard modeling grid, the modeling effort also included a number of special receptors, namely the six Tri-State Geographic Initiative air monitoring sites and a number of locations that were thought to be populated by particularly sensitive individuals (e.g., schools). The six monitoring stations were assigned the following names to correspond to the names used in the air monitoring risk assessment report (USEPA 2000a): Centennial Drive, Corn Field Kenova Fire Station, Kenova Water Plant, Sweet Run and Lockwood Estates.

2.1.2.2 Modeling Data

TASK 1

TASK 1 results included two values: the maximum one-hour ambient concentrations and the annual average concentration for each modeled chemical at each receptor location based on maximum emission rates provided by each industry. These data were considered to represent the situation of continuous maximum emissions. However, since Ashland Petroleum provided only typical day emission estimates, the modeled concentrations developed for this facility may underestimate the true maximum concentrations for Ashland Petroleum.

TASK 2 - Episode Modeling

Ten one day episodes were selected for detailed investigation as part of the Kenova Air Modeling Project. These episodes were selected using a variety of data that may reflect days with elevated constituents detected at air monitoring stations, days with an unusual number of citizen complaints, days with releases reported by local facilities, or days identified by inspection reports with unusual or unexplained events.

To select the episodes, agency experts in the fields of air monitoring, compliance assurance, and field inspections evaluated the data sets. Based on their best judgement and expertise, these individuals identified a set of days for further investigation through air modeling. The episodes were selected to accommodate as many of these days as possible. Ten episodes were identified varying between 48 hours and 7 days in length. More information on each episode is provided in USEPA (2000b).

Data generated for episode modeling included the one hour maximum concentration for each chemical at each of the 4022 receptors, and the 24-hour average concentrations for the block of days included in each episode.

TASK 3

TASK 3 results differed from TASK 1 results by the incorporation of variable emission data into the dispersion modeling (rather than constant maximum emission rates). Of the 35 pollutant species modeled, Ashland Petroleum emitted 33 of the 35 pollutants, Ashland Chemical emitted three pollutants, Aristech Chemical emitted one pollutant and Calgon Carbon Company emitted two pollutants. Three of the four facilities, Ashland Chemical, Calgon Carbon Company and Aristech Chemical provided daily emissions data for the modeling period July 15, 1996 to July 14, 1997. These data were used in the TASK 3 modeling effort. In contrast, Ashland Petroleum provided a listing of events depicting major deviations from their routine operations. Of the 33 pollutants released by Ashland Petroleum, only 12 of the pollutants showed some variability in their emission rates. These variations were included in the TASK 3 modeling.

Task 3 results included two values: the maximum one hour ambient concentration and the maximum annual average concentration for each chemical at each receptor location based on variable emission rates provided by each industry.

2.1.3 COPC Screening

USEPA guidance (USEPA 1989a) recommends focusing risk assessments by quantifying risk only for a select list of chemicals of potential concern (COPCs) at a site. These chemicals, which are a subset of all detected chemicals in a given medium, are defined as those chemicals likely to drive the overall potential risks for a site.

For the purposes of the Kenova Industrial Cluster air monitoring and air modeling risk assessments, COPCs for a particular medium are limited to those chemicals that exceed a selected risk-based screening criterion. USEPA Region 3 has developed a database of risk-based concentrations (RBCs) for the inhalation pathway. For chemicals present in air, the Region 3 RBCs were used as screening values where available. An on-line version of this database (as of

April 2000) was consulted to obtain screening values. All screening was performed at a carcinogenic risk level of 1E-6 and a hazard quotient level for noncarcinogens of 0.1. Additional information on the COPC screening process used and the complete results of the screening for each monitoring location are provided in USEPA (2000a) and USEPA (2000b). A summary of COPCs retained for risk evaluation in the air monitoring risk assessment is presented in Table 2-4. A summary of COPCs retained for risk evaluation in the air modeling risk assessment is presented in Table 2-5.

2.1.4 Exposure Assessment

The purpose of the exposure assessment is to determine who is potentially exposed to airborne pollutants and how those exposures occur, including the magnitude and frequency of potential exposures to each of the compounds included in the risk assessment. The first step in this assessment is the development of a model that describes how chemicals are released into the environment and ultimately are taken into the human body.

2.1.4.1 Conceptual Site Model

Conceptual models for the exposure pathways evaluated in this study were developed and are presented in USEPA (2000a) and USEPA (2000b). A generalized version of the conceptual site models used for the air monitoring and air modeling risk assessments is provided in Figure 2-1. As shown in the model, hazardous air pollutants are potentially emitted to ambient air from a variety of sources and transferred to human receptors such as adult or child-age residents. The direct exposure pathway for this medium is the inhalation pathway. Further discussion on the conceptual site model is presented in USEPA (2000a) and USEPA (2000b). The rationale for the selection of the receptors selected for the conceptual models is provided in the next section.

2.1.4.2 Potential Receptors and Exposure Pathways

Potential receptors were identified for existing land use conditions. The receptors were identified by analyzing the interaction of current land use practices and identifying sources of contamination.

For both risk assessments, current receptors included both adult and child residential receptors. Residents currently live in close proximity to all sampling locations (Environmental Systems Research Institute, Inc. (ESRI)1998. Data and Maps CD-ROM). A residential receptor was selected for evaluation as it represents the receptor that would be expected to be most protective of human health. Further discussion on the potential receptors is presented in USEPA (2000a) and USEPA (2000b).

2.1.4.3 Quantification of Exposure

Estimates of exposure are based on the contaminant's concentrations at the exposure point and on scenario-specific assumptions and intake parameters. The models and equations used to quantify intakes are described in this section and have been obtained from a variety of USEPA guidance documents which are cited in the specific intake estimation sections that follow.

Determination of Exposure Point Concentrations

To quantitatively evaluate the risks to exposed individuals from a selected environmental medium, concentrations of the COPCs in that medium must be determined. The concentration of the COPC calculated is referred to as the exposure point concentration (EPC). Ideally, the exposure point concentration should be the true mean concentration to which an individual is exposed. However, it is generally not possible to calculate this value since only a sample from a population is available. Therefore, the existing sample data was used to derive a conservative

estimator of the true population mean to represent the EPA, as recommended in EPA guidance (USEPA 1992a).

Specifically, for the air monitoring data, the 95% UCL of the mean was calculated for each COPC at each stationary monitoring location or mobile laboratory location based on the methodology presented in USEPA (1992a) which follows Gilbert (1987). It should be noted that the equation selected to calculate the 95% UCL depends on the distributional form of the data. If the data were lognormally distributed, the 95% UCL equation for normal data was used. If the data were determined not to be normally distributed, they were presume to be lognormal and the 95% UCL equation for lognormal data was used. USEPA (2000a) presents the results of the EPC calculations for the air monitoring risk assessment.

For the air modeling risk assessment, modeled ambient air data for each chemical at each receptor location was used as the exposure point concentration for each individual location. The data represent annual arithmetic mean air concentrations of each chemical at each location. Data for Task 1 and Task 3 were evaluated separately. USEPA (2000b) presents the EPCs used for the air monitoring risk assessment.

It is important to emphasize the difference in the way the EPCs used between the air monitoring report and the air modeling report were calculated. For exposure point concentration (EPC) in the monitoring report, the lesser of the 95% UCL of the arithmetic mean or the maximum value found was used as a conservative estimator of annual average concentration. The value was selected in this way because the monitored data set provides only a small sample from a very large population and requires a conservative methodology in its evaluation, so as not to potentially underestimate true population exposure and risk.

The modeling results, on the other hand, produced a straight arithmetic average based on a very large number of values modeled for a one hour time period (for example, for TASK 1 and 3 data, a modeled value is generated for every hour for a year and then averaged to produce an annual

average). This large number of modeled points should result in a relatively good estimation of the true arithmetic mean for the constituents modeled. As such, no 95% UCL was used in the modeling risk assessment.

Exposure Parameters and Intake Equations

In any given population, exposure is most accurately described by a distribution of intakes. A distribution arises due to, among other things, variation among individuals in exposure parameters. For example, in a group of exposed individuals, there will be a distribution of breathing rates, body weights, etc., which lead to different amounts of exposure for different people. There may also be uncertainty in the exposure distribution due to such factors as measurement inaccuracies and model errors.

To communicate this inherent variability and uncertainty, USEPA guidelines recommend that risk assessments should include, where possible, "average" or "central tendency" evaluations of exposure and risk as well as a "high end," and "upper bound" exposure and risk estimates (USEPA 1989a). The air monitoring and air modeling risk assessments evaluated both a central tendency as well as a highly exposed residential scenario for a child and an adult residential receptors.

To calculate exposure and risk for a highly exposed individual, a high-end estimate of exposure was developed by using maximum or near maximum values[1] for one or more sensitive exposure factors while leaving others at their mean value (USEPA 1991, USEPA 1997b). Performing the risk assessments in this fashion resulted in high end descriptors of exposure and risk that are conservative, but are not likely to be higher than the highest exposure for the population in question.

[1] *For example, when percentiles are available for a particular exposure parameter, a maximum or near maximum value would generally be represented by values in the upper tail (i.e., between the 90th and 99.9th percentile) of the distribution.*

To calculate exposure and risk for a more average individual, exposure parameters were set at more central tendency (CT) values. Exposure parameters used in the CT evaluation were a mixture of upper-bound and 50-th percentile values, mostly derived from EPA's *Exposure Factors Handbook* (USEPA 1997b). A mixture of upper bound and average values is used to provide an estimate of what may be typical exposures, but one that is still conservative.

Calculation of the intake factor or the daily dose for each chemical and receptor was performed in both risk assessments. The intake factors are equivalent to the daily dose of each chemical for each receptor at each location on a mass-equivalence basis. The formula for the intake calculation for the air inhalation pathway is presented below. Intake values for adult and child receptors for carcinogenic chemicals were calculated separately, then combined into total lifetime intake values. This method provides results identical to those obtained from the calculation of incremental lifetime risks though development of age-adjusted factors, improves the ease of spreadsheet verification and is, therefore, the preferred method.

The following intake equation was applied to determine intakes for the receptors exposed to ambient air (resident adults and resident children).

$$Intake\ (dose)\ (mg/kg-day) = \frac{C_{air} \times EF \times ED \times IHR \times 1/CF3}{BW \times (AT_c\ or\ AT_n) \times 365}$$

Where:

C_{air} = Chemical Concentration in air (µg/m^3)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

IHR = Inhalation Rate (m^3/day)

CF3 = Conversion factor from µg to mg (1000 µg/mg)

BW = Body Weight (kg)

ATc = Averaging Time - Carcinogens (years)

ATn = Averaging Time - Noncarcinogens (years)

365 = 365 days/year

Air concentrations used in this intake equation represented the EPCs calculated for each COPC identified for each sampling location in the air monitoring risk assessment, or the EPCs determined from the air modeling in the air modeling risk assessment (USEPA 2000a, 2000b). Standard exposure factors were utilized in these calculations, and are presented in Tables 2-5 and 2-6 for the adult and child resident receptors, respectively. Exposure parameters used in central tendency calculations are presented in Tables 2-7 and 2-8.

2.1.4.4 Toxicity Assessment

The toxicity assessment examines information concerning the potential human health effects associated with exposure to COPCs. The goal of the toxicity assessment is to provide, for each COPC, a quantitative estimate of the relationship between the magnitude and type of exposure and the severity or probability of human health effects. The toxicity values are integrated with the outputs of the exposure assessment to characterize the potential for the occurrence of adverse health effects.

The toxicity assessment involves the identification of cancer and noncancer health effects associated with each of the chemicals that have been selected as contaminants of potential concern (COPCs). It also provides useful information regarding the quantitative relationship between exposure and probability or severity of adverse health effects, also referred to as the dose-response relationship.

The hierarchy of toxicological information sources used during these evaluations was based on the recommendations presented in RAGS (1989a). The primary source of these values was the Integrated Risk Information System (IRIS) database (USEPA April 2000). In the absence of toxicological data from IRIS, the secondary source to review for this information was the Health Effects Assessment Summary Tables (HEAST) (USEPA 1997). When there was no data

available from either of these sources, the provisional values that were developed by the National Center for Environmental Assessment (NCEA) were used. Finally, if toxicity values were not available from any of the sources listed above, toxicity values withdrawn from IRIS or HEAST were considered for use. Toxicity tables include the primary target organs or organs affected by a particular chemical or the critical effect of a chemical, as listed in IRIS. This information was used in the risk characterization in the air monitoring report to segregate risks by target organ effects, when a Hazard Index exceeded unity. Target organ risk segregation was not performed for the modeling data owing to the complexity of the data sets.

A complete listing of the noncancer oral and inhalation toxicity data used in the air monitoring risk assessment is provided in Tables 4.5-1 and 4.5-2 of that report (USEPA 2000a). For the air modeled risk assessment, a complete listing of the noncancer oral and inhalation toxicity data used is provided in Tables 3.5-1 and 3.5-2 of that report (USEPA 2000b).

A complete listing of oral and inhalation cancer toxicity used in the air monitoring risk assessment is provided in Tables 4.6-1 and 4.6-2 of that report (USEPA 2000a). For the air modeling risk assessment, a complete listing of oral and inhalation cancer toxicity data is provided in Tables 3.6-1 and 3.6-2 of that report (USEPA 2000b).

A complete listing of oral and inhalation cancer toxicity data used in the air monitoring risk assessment is provided in Tables 4.6-1 and 4.6-2 of that report (USEPA 2000a). For the air modeling risk assessment, a complete listing of oral and inhalation cancer toxicity data is provided in Tables 3.6-1 and 3.6-2 (USEPA 2000b).

As specified in the implementation plan for these risk assessment, oral RfDs were used in inhalation calculations when inhalation toxicity factors (either cancer or noncancer) could not be obtained. No additional uncertainty factors were applied when using oral RfDs to represent inhalation RfDs (TGI 1997c).

2.1.4.5 Risk Characterization

The risk characterization portion of the risk assessment combines information on intake (from the exposure assessment) with information on toxicity (from the toxicity evaluation) to develop both quantitative and qualitative statements about the potential risk posed by the exposure in question. Risk characterization procedures have been discussed in the air monitoring and air modeling risk assessment reports. Procedures used in each analysis were identical (USEPA 2000a, 2000b). This section provides a comparison of the chronic risk results developed by both the monitoring and modeling efforts for the Kenova Industrial Cluster.

2.2 COMPARISON OF CHRONIC RISK RESULTS

2.2.1 Noncarcinogenic Effects Results

Comparisons of noncarcinogenic risks calculated for each stationary monitoring location using results from the air monitoring and the air modeling are presented in Tables 2-9 through 2-14 for the child RME receptor, and in Tables 2-15 through 2-20 for the adult RME receptor. Figures 2-2 through 2-5 present these results graphically for cumulative noncarcinogenic hazards. Mobile lab noncarcinogenic risk results are summarized in Appendix A, Tables A-1 and A-2.

Cumulative noncarcinogenic hazard indices (HIs) differed by approximately one order of magnitude or less between monitored and modeled risk results for each monitoring location. In all cases, risks from the monitoring data exceeded risks from the modeling data. The greatest difference in the risk results was found at the Kenova Fire Station and Lockwood Estates where the difference in the risk results slightly exceeded one order of magnitude. These differences are presented graphically for the child resident receptor in Figures 2-6 through 2-11. These figures illustrate that relative magnitude of HQs obtained at each air monitoring location for analytes included as COPCs in both the air monitoring risk assessment (both stationary and mobile samplers) and the air modeling risk assessment.

Cumulative noncarcinogenic HIs were more similar between modeled risk results and results for the mobile lab. A similar elevation in risk compared to modeled results was observed at the Kenova Fire Station location for the mobile lab data. In addition, although no modeling receptor was located precisely at the South Point Ethanol mobile lab location, it can be seen from Figures 2-2 to 2-5, the HIs at surrounding receptors were less than one. In contrast, the HI for the child receptor at the South Point Ethanol mobile lab location was 1.8.

Major differences in hazard quotients (HQs) calculated for individual chemicals are present in the two sets of risk results. HQs in excess of one were calculated for benzene and manganese for most locations using the stationary monitoring air data (See Figures 2-6 though 2-11). For the modeling results, only chlorine was calculated to occur at HQs greater than one. Chlorine was not analyzed for in the air monitoring study (TGI 1997a) due to analytical limitations for this gas. Both benzene and manganese were modeled in the modeling study (USEPA, Region 5 2000). However, manganese was not retained as a COPC in the modeling risk assessment (USEPA 2000b). The majority of the modeled VOC COPCs were also found to be COPCs at most of the stationary monitoring locations.

HQs for individual chemicals were somewhat comparable between the risk results for the modeled data and for the mobile lab data. The majority of the modeled VOC COPCs were also found to be COPCs at most of the mobile lab sampling locations. However, many constituents analyzed for by the mobile lab were not included in the modeling.

Central Tendency analyses were performed identically between the monitoring and modeling risk assessments. As such, comparisons of the results between the two risk assessments yields similar findings to those detailed above, although the magnitude of risks is lower overall.

Hazard Indices at each monitoring location were segregated according to target organ effects for the monitoring and modeling data sets. These results are presented in Appendix B. Results of this analysis showed that all locations with HI over one for either the child or the adult residential

receptor also had at least one organ system with an HI over one as well. Typically, the data from the monitoring study included HIs over one for both the nervous system and the respiratory system while data from the air modeling study resulted in HIs one one for the respiratory system only. This difference was due almost entirely to the higher concentrations of benzene, a neurotoxin, obtained in the air monitoring study.

2.2.2 Carcinogenic Effects Results

Comparisons of carcinogenic risks calculated for each stationary monitoring location using results from the air monitoring and the air modeling are presented in Tables 2-21 through 2-26 for the child RME receptor, in Tables 2-27 through 2-32 for the adult RME receptor, and in Tables 2-30 through 2-35 for the lifetime RME receptor. Figures 2-12 through 2-17 present these results graphically for cumulative carcinogenic risks. Mobile lab carcinogenic risk results are summarized in Appendix A, Tables A-3 through A-5.

Cumulative carcinogenic risks differed by less than one order of magnitude between monitored and modeled risk results for all monitoring locations except the Kenova Fire Station. In all cases, risks from the monitoring data exceeded risks from the modeling data. The greatest difference in the risk results was found at the Kenova Fire Station where the difference in the risk results approached two orders of magnitude. Risks based on monitored results from the stationary samplers were almost two orders of magnitude greater than those predicted by the model for this location. These differences are presented graphically for the Lifetime resident receptor in Figures 2-18 through 2-23. These figures illustrate that relative magnitude of the incremental cancer risks obtained at each air monitoring location for analytes included as COPCs in both the air monitoring risk assessment (both stationary and mobile samplers) and the air modeling risk assessment.

Cumulative carcinogenic risks differed by less than one order of magnitude between mobile lab and modeling risk results for all monitoring locations except the Kenova Fire Station (see Figures

2-19 through 2-21). Modeling risks were greater than mobile lab risks for the Corn Field sampling location. Similar to the stationary sampler results, risks based on the mobile lab results were more than one order of magnitude greater than modeled results for this location.

Congruence between risks from individual chemicals was relatively poor between the monitoring and modeling results. For example, nickel was identified as a risk driver based on modeled results with risks greater than 1E-6 for four out of six monitoring locations. However, risks from nickel based on monitored results did not exceed 1E-6 for any monitoring location. Risks from benzene were consistently higher based on monitoring results than on modeled results. Where arsenic was identified as a COPC for the monitoring results from each station, arsenic risks from the monitoring results were consistently higher than those based on modeled results.

Several risk drivers, defined as chemicals with lifetime risks greater than 1E-6, included in the modeling results were not analyzed for in the stationary sampler air monitoring program. These included 1,3-butadiene and carbon tetrachloride. Conversely, several risk drivers from the air monitoring risk assessment were not included in the modeling analysis, including chloromethane, dichloromethane, cadmium and chromium. This resulted from the selection process for the analytes to be considered in the modeling effort. Modeled analytes were limited to chemicals reported be the four target industries in their TRI reports. Monitoring was performed for a broader range of analytes and was limited by air sampling and analysis methodology.

The two carcinogenic VOC COPCs from the air modeling results were also identified as COPCs at all four (benzene) or in two of four (carbon tetrachloride) mobile lab locations. Risks from these constituents were within one order of magnitude except at the Kenova Fire Station. At this location, risks from the mobile lab data exceeded the modeled results by more than an order of magnitude for carbon tetrachloride.

Central Tendency analyses were performed identically between the monitoring and modeling risk assessments. As such, comparisons of the results between the two risk assessments yields similar findings to those detailed above, although the magnitude of risks is lower overall.

3.0 ACUTE RESULTS

The assessment presented in Section 2.0 evaluated the potential health risks resulting from long-term (chronic) exposure to airborne toxicants. The risk analysis used an estimate of the annual average concentrations to which residents are exposed to make these risk estimates since the annual average is more representative of long term exposures than the individual sampling or modeling events from which the average is derived.

However, the health effects that persons may experience due to short-term (acute) exposures to higher levels of airborne contaminants can vary significantly from those experienced after long-term exposure to low doses, depending on the contaminant and its concentration. For example, a chemical that produces an increase in cancer rates after exposure to low concentrations for a long period of time (a chronic effect) might also cause immediate and severe eye irritation if present at high levels for a short period of time (an acute effect).

3.1 COMPARISON OF METHODOLOGY–ACUTE

Acute effect risk assessments were conducted for both the air monitoring results and the air modeling conducted for the Tri-State Geographic Initiative. Air sampling was conducted at six stationary locations throughout the study area and another stationary sampler located in an area thought not to be affected by the industries potentially impacting the Kenova Industrial Cluster. In addition, a mobile laboratory was utilized to conduct air monitoring at four locations throughout the study area. Samples from the mobile laboratory were collected over one-hour sampling periods for analysis for volatile organic compounds. Section 2.1.1 of this report summarizes data collected in the air monitoring program.

The air modeling performed for this project ran both CALMET and CALPUFF for a full year period using inputs for the four sources in the Kenova Industrial Cluster (USEPA Region 5, 2000). Modeling assumptions used to generate data for TASK 1, TASK 2 and TASK 3 have

been presented in Section 2.1.2.1 and are discussed in detail in USEPA (2000b). Data generated in the modeling effort has been described in Section 2.1.2.2 of this report.

Chemicals selected for the air modeling effort were selected based on the TGI facilities' TRI reports, which the initiative confirmed during meetings with the industries. All of the chemicals in the facilities' air emissions were modeled, except any USEPA "criteria pollutants" including: ozone, carbon monoxide, nitrogen oxides, sulfur dioxide, particulate matter, and lead.

3.1.1 General Approach

To determine the potential for adverse health effects to occur from short-term exposure to elevated levels of airborne contaminants, each sample result or modeling event collected in these studies was compared to an acute health-based screening value, if available. Because these were screening-level evaluations of potential acute health effects, it was assumed that if a contaminant exceeded the screening criteria then there was a potential for adverse human health effects.

3.1.2 Data Used in these Analyses

Data generated by the TGI Kenova Industrial Cluster air monitoring program and air modeling program has been described in Section 2.1 of this report. Data used in the acute evaluation included the following:

- Routine 24-hour samples collected at each of seven stationary air sampler locations
- Triggered 24-hour samples collected at the Kenova Fire Station for VOCs only. A total of 22 triggered 24-hour samples were collected over a one year period
- One-hour samples collected at four locations by the State of Kentucky mobile lab. Samples were collected for VOCs only for every hour over a two week to six week period.
- One-hour maximum concentrations generated during Task 1 of the air modeling program

- One-hour maximum concentrations generated during Task 3 of the air modeling program
- Maximum 24-hour average concentrations generated during Task 2, Episodes 1 though 10 of the modeling program
- One-hour maximum concentrations generated during Task 2, Episodes 1 though 10 of the modeling program

These various analyses provided a considerable number of data points for acute screening based on the air monitoring and air modeling investigations.

3.1.3 Location of Data Points

As discussed previously, air monitoring results were generated for six sampling locations in the Kenova Industrial Cluster. The six stationary monitoring locations were entitled Centennial Drive, Corn Field, Kenova Fire Station, Kenova Water Works, Lockwood Estates, Sweet Run. A reference air monitor was established outside of the study area in a location that was considered to have comparable meteorological conditions, and was generally not within the influence of the major industries within the cluster (TGI 1997a). This sampling location has been entitled Webbville. In addition, data from the State of Kentucky mobile laboratory were used in this evaluation. Mobile laboratory data were collected from three of the stationary monitoring locations (Corn Field, Kenova Fire Station and Kenova Water Works) and an additional station located in South Point, Ohio.

A total of 4022 discrete receptors were modeled within the sampling domain. Further discussion on receptor locations is presented in USEPA (2000b). All stationary sample locations included in the air monitoring effort were included in the modeling conducted for the TGI project with the exception of the South Point Ethanol Mobile lab location and the Webbville location.

3.1.4 Periodicity and Length of Exposure

USEPA views intermittent exposure as that lasting less than 24 hours and occurring no more frequently than monthly (USEPA 1994). This assumes that an acute exposure is at least 10 times higher than a monthly average and that individual exposures are independent of one another. USEPA has also pointed out that very few chemicals will have enough data to determine a safe periodicity of an acute exposure. As such, each sample and/or modeled data point collected during the investigations was evaluated as a single, independent exposure.

Samples collected by the stationary and triggered samplers were evaluated with the assumption that a person would be exposed to the detected concentration for no more than 24 hours. Samples collected by the mobile lab were evaluated with the assumption that a person would be exposed to the detected concentration for no more than 1 hour.

For the air modeling risk assessment, 24 hour modeled data were evaluated with the assumption that a person would be exposed to the detected concentration for no more than 24 hours. One hour modeled data were evaluated with the assumption that a person would be exposed to the concentration for no more than 1 hour.

3.2 SOURCES OF ACUTE HEALTH-BASED SCREENING VALUES

With few exceptions, there is no simple or widely accepted method for estimating the risks of routine short-term exposures to elevated concentrations of most toxic chemicals found in ambient air samples. As such, there are no uniformly accepted short-term air action levels for the majority of emissions from facilities and other common emission sources such as area sources. Instead, concentrations of chemicals protective of acute exposures have been established using a variety of differing methodologies. For example, occupational exposure limits are sometimes used to develop exposure values (acute and chronic) for protection of the general public. Such values are usually generated by dividing the occupational number by safety factors that can range

from 4.2 to as great as 1,000 or more. The concept behind such safety factors is to account for differences between workers, for which the standards were developed, and residents, for which they were not (USEPA 1993).

Unlike the screening values developed to evaluate chronic exposures, only a limited number of benchmarks for acute inhalation exposures have been developed at this time for non-emergency acute exposures. Tables 3-2 and 3-3 provide the screening values used for comparison with 24 hour and 1 hour samples or modeling data points. Extensive research was conducted and detailed discussions with USEPA representatives and toxicologists from the National Center for Environmental Assessment resulted in the selection of these acute screening values. For the specific details pertaining to the specific definitions of the various acute screening values, please refer to USEPA (2000a) and USEPA (2000b).

3.3 SCREENING VALUE SELECTION

Procedures used to develop the acute screening values used in these acute risk assessments have been presented in USEPA (2000a) and USEPA (2000b). Sections 3.3.1 and 3.3.2 provide an overview of the detailed information provided in the referenced documents.

3.3.1 24 Hour Screening Value Hierarchy

For comparison to 24 hour values, the following hierarchy was used:

1. Agency for Toxic Substances and Disease Registry (ATSDR) Acute Minimum Risk Levels (MRLs)
2. California Environmental Protection Agency's (Cal EPA) Reference Exposure Levels (RELs) adjusted to 24 hours using Haber's Law for all chemicals regardless of evaluation endpoints

3. EPA Acute Emergency Guidance Levels (AEGLs) - (using AEGL-1 which is the LOAEL) adjusted to 24 hours using Haber's Law
4. American Industrial Hygiene Association's (AIHA) Emergency Response Planning Guidelines (ERPG's-1) and Short-term Public Emergency Guidance Levels (SPEGLs) adjusted to 24 hours using Haber's Law

This hierarchy should be read as follows: For evaluation of 24 hours samples, first attempt to use ATSDR Acute MRLs. If no MRL is available, then use CAL RELS adjusted to 24 hour values using Haber's Law. If there is no MRL or CAL REL for a chemical, then use the 8 hour AEGL-1 adjusted to 24 hours using Haber's Law. Finally, if no AEGL is available, use ERPG-1, or SPEGLs adjusted to 24 hours using Haber's Law.

For a complete discussion of the decision making process utilized in the selection of this hierarchy, the reader should refer to information provided in USEPA (2000a) and USEPA (2000b).

3.3.2 1-hour Screening Value Hierarchy

For comparison to 1 hour values, the following hierarchy was used.

1. CAL RELS
2. EPA AEGLs-1 (one hour values)
3. AIHA ERPGs-1 and SPEGLs (one hour values)
4. DOE TEELs-1 (adjusted to one hour values by Haber's Law)
5. ATSDR MRLs (adjusted to one hour values by Haber's Law)

CAL RELS are one hour values and were used with no modification. Where results for RELS were based on developmental or reproductive endpoints, these RELS were applied directly with no adjustment for time period of exposure. Typically, studies with these endpoints used a 4 to 8

hour exposure period. However, uncertainty exists in the actual time period needed to accumulated a dose resulting in a developmental or reproductive effect. Therefore, as a conservative measure these RELS were not adjusted.

For a complete discussion of the decision making process utilized in the selection of this hierarchy, the reader should refer to information provided in USEPA (2000a) and USEPA (2000b).

3.4 COMPARISON OF ACUTE RESULTS

The results for each sampled and/or modeled event were compared to their respective health-based screening levels for one-hour exposures or 24-hour exposures. When the maximum detected concentration of a contaminant for any receptor locations exceeded the selected acute exposure screening value, a ratio of the detected concentration to its screening value was calculated. This information is intended to quantify the magnitude of the exceedance. Similar to chronic hazard quotients, the amount by which an airborne concentration of a chemical exceeds its acute benchmark is expressed by an acute hazard quotient, thus:

$$HQacute = \frac{[chemical]}{[benchmark]acute}$$

Also similar to chronic hazard quotients, it is important not to interpret such ratios as a statistical probability. A ratio of 0.001 does not mean that there is a one in one thousand chance of the effect occurring. Further, it is important to emphasize that the level of concern does not increase linearly as the acute benchmark is approached or exceeded because acute benchmarks do not have equal accuracy or precision and are not based necessarily based on the same severity of toxic effects. In addition, due to the wide ranging sources and methodologies from which these acute benchmarks were derived, it was considered inappropriate to sum the individual acute HQs at a given location into a cumulative hazard index.

Table 3-3 provides a comparison of hazard quotients which exceeded one for the monitoring locations and modeling locations. Hazard quotients for monitored chemicals that exceeded one included sulfur dioxide and sulfate. Exceedances occurred at seven of the stationary monitoring locations (24 hour samples). The modeling results indicated that nickel was the only compound with a hazard quotient exceeding one for a stationary sampler receptor location. This exceedance occurred at the Corn Field Special Receptor location for Task 2, Episode 10. Figure 3-1 provides a map of the one location where the acute hazard quotient exceeded one for a stationary sampling location special receptor. Note that while nickel was assessed in the monitoring analysis, sulfur dioxide and sulfate were not evaluated in the modeling analysis.

4.0 DISCUSSION

4.1 COMPARISON OF CHRONIC RISK RESULTS

In general, the comparison of the risk assessments based on monitored and modeled results showed a number of differences between the two risk assessments. Cumulative HIs and cancer risks tended to be higher by an order of magnitude or less for most of the monitoring locations for either the stationary sampler results or the mobile lab results as compared to the modeling results for the same locations. However, for the Kenova Fire Station location both types of monitoring results exceeded modeling results by more than one order of magnitude for both HIs and cumulative cancer risks. Monitored noncancer HIs also exceeded one order of magnitude difference (higher) than those estimated by modeling. The air modeling was based on reported industrial emissions only. Emissions from other local sources, such as small businesses and mobile sources such as cars and trucks, were not included in the modeling analysis. Possibly, the differences in the risk results at the Kenova Fire Station, and to a lesser extent at the other monitoring locations are a function of localized emissions.

For cumulative carcinogenic risks, results based on the monitored data exceeded those based on the modeled data for all stationary sampler and mobile lab locations. Where chemicals were included in both data sets, this observation was true for all individual chemical risks with one exception. For the modeled data set, cancer risks from nickel exceeded 1E-6 for four out of six monitoring locations. However, risks from nickel based on monitored results did not exceed 1E-6 for any monitoring location. As discussed in the modeling report (USEPA Region 5, 2000) deposition was not accounted for during modeling. It is possible that nickel would be subject to both wet and dry deposition after emission, resulting in artificially high modeled nickel concentrations. Specifically, deposition of nickel may account for the differences observed between the modeling and monitoring data sets.

Monitor-based noncarcinogenic and carcinogenic risks at the South Point Ethanol mobile lab location appeared elevated compared to risks at surrounding modeling grid points. However, emissions from local industries in the South Point area were not included in the emission modeling (TGI 1997b). At the time that the modeling grid was established, it was not known that the mobile lab would sample in the South Point area. From the results obtained for this location, it appears that localized emissions contributed to the sampling results.

Uncertainties in each risk assessment have been discussed in their respective risk reports (see USEPA 2000a, 2000b). Many of these uncertainties are identical between the two risk assessments. Only additional uncertainties raised by the comparison of risk results will be discussed below.

An uncertainty in comparing the results between the air monitoring and air modeling risk assessments lies in the chemicals selected for inclusion in the two risk assessments. As can be seen from Tables 2-2 and 2-3, not all chemicals included in the modeling analysis were included in the monitoring sample analysis. Although the reverse is also true, chemicals selected for modeling were limited to those emitted by the identified industries. As such, not all chemicals included in the air monitoring program would be expected to be emitted by those four industries, and would therefore not have been candidates for inclusion in the modeling report. Other uncertainties regarding chemicals not included in the risk assessments would be similar between reports and have been discussed in the uncertainty section of the individual risk assessments.

An additional uncertainty in comparing the results between the air monitoring and the air modeling risk assessments includes the difference in the EPC value selected for each risk report. For exposure point concentrations (EPC) in the monitoring report, the 95% UCL of the arithmetic mean was used as a conservative estimator of annual average concentration. This value was selected because the monitored data set was based on only a relatively small sample from a large population.

The modeling results, on the other hand, produced a straight arithmetic average based on a large number of values modeled for a one hour time period. This large number of modeled points should result in a relatively good estimation of the true arithmetic mean for the constituents modeled. As such, no 95% UCL was used in the modeling risk assessment. This difference in the EPCs used in the two risk assessments may account for some of the differences seen in the results. Specifically, the use of a highly conservative estimator of annual average (a 95% UCL) may tend to overestimate the risks associated with detected chemicals. Other differences in parameter value uncertainty have been discussed in the individual risk assessment reports.

No uncertainties unique to this comparison exist in the areas of model applicability and assumptions and toxicity assessment uncertainty factors. For discussions of uncertainties in these areas the reader is referred to the air monitoring and air modeling risk assessment reports (USEPA 2000a, 2000b).

4.2 COMPARISON OF ACUTE RISK RESULTS

In the modeling study, only one acute exceedance at a stationary monitoring location special receptor was calculated. The exceedance occurred for nickel in Task 2, Episode 10, 24 hour comparisons, at the Corn Field location. Air monitoring data for nickel concentrations measured at the Corn Field location did not exceed the selected acute screening value.

Mobile lab data were collected at four locations: Corn Field, Kenova Fire Station, Kenova Water Works, and the Southpoint Ethanol Site. Samples were collected only for volatile organic compounds. The sampling time was one hour. For the mobile laboratory data, no contaminants were determined to be present at a concentration greater than the selected acute screening value.

It is important to note that not all chemicals included in the monitoring program were included in the modeling which was conducted for the TGI study area. Sulfur dioxide exceeded the acute screening value for two locations in the air monitoring study. Since sulfur dioxide is a USEPA

"criteria pollutant," it was not included in the air modeling study. Sulfates, which were also found to have acute hazard quotients greater than one in the monitoring effort, were not included in the modeling effort. A direct comparison between monitoring results and modeling results is not possible for these constituents.

5.0 CONCLUSIONS

In support of the TGI Air Toxics Project, two risk assessments evaluating the potential risks to the population of the Kenova Industrial Cluster from exposure to airborne contaminants have been completed (see USEPA 2000a, and USEPA 2000b). This report presents a comparison of the results of the human health risk assessments and acute effects evaluations performed using the air monitoring data and air modeling data developed for the Kenova Industrial Cluster during the 1996 and 1997 time period. Both risk assessments focused on direct exposure to airborne contaminants through the inhalation pathway. Risk evaluations of the results of air monitoring program are presented in the *Tri-State Geographic Initiative Kenova Industrial Cluster Air Monitoring Risk Assessment Report* (USEPA 2000a). Risk evaluations of the results of air dispersion modeling project are presented in the *Tri-State Geographic Initiative Kenova Industrial Cluster Air Modeling Risk Assessment Report* (USEPA 2000b).

Overall, risks based on modeled results tended to be lower than those based on monitored results both for cumulative HIs or cancer risks or for risks or hazards for individual chemicals. The extend of the difference in results was rarely greater than one order of magnitude and frequently, the differences were less. One exception to this observation was nickel. Nickel was identified as a risk driver based on modeled results with risks greater than 1E-6 for four out of six monitoring locations. However, risks from nickel based on monitored results did not exceed 1E-6 for any monitoring location. As discussed in the modeling report (USEPA Region 5, 2000) deposition was not accounted for during modeling. It is possible that nickel would be subject to both wet and dry deposition after emission. The absence of deposition of nickel may account for the differences observed between the modeling and monitoring data sets.

For the Kenova Fire Station location both types of monitoring results exceeded modeling results by more than one order of magnitude for both HIs and cumulative risks. However, since the modeling are based only on releases of TRI chemicals from the four facilities, the differences in the risk results at the Kenova Fire Station, and to a lesser extent at the other monitoring locations

may be a function of localized emissions and out of area transport collected by the aor monitoring systems.

Slightly different sets of analytes were used in the modeling and monitoring efforts. This resulted from the selection process for the analytes to be considered in the modeling effort. Modeled analytes were limited to chemicals reported be the four target industries in their TRI reports. Monitoring was performed for a broader range of analytes and was limited by air sampling and analysis methodology. For example, two carcinogenic risk drivers, defined as chemicals with lifetime risks greater than 1E-6, included in the modeling results, were not analyzed for in the stationary air monitoring program. These were 1,3-butadiene and carbon tetrachloride. Conversely, several risk drivers from the air monitoring risk assessment were not included in the modeling analysis. These were chloromethane, dichloromethane, cadmium and chromium. As a result, comparisons can only be performed for chemicals that were included in both the air monitoring and air modeling efforts.

In the modeling study, only one acute exceedance at a stationary monitoring location special receptor occurred. The exceedance was for nickel in Task 2, Episode 10, 24 hour comparisons, at the Corn Field location. Air monitoring data for nickel concentrations measured at the Corn Field location did not exceed the selected acute screening value. As discussed in the modeling report (USEPA Region 5, 2000) deposition was not accounted for during modeling. Since nickel would be subject would be subject to both wet and dry deposition after emission, and these depositions were not factored into the modeling, this may account for the differences observed between the modeling and monitoring data sets.

Two additional chemicals included in the monitoring program that were not included in the modeling were sulfur dioxide and sulfates. Sulfur dioxide exceeded the acute screening value for two locations in the air monitoring study. Since sulfur dioxide is a USEPA “criteria pollutant,” it was not included in the air modeling study. Sulfates, which were also found to have acute hazard quotients greater than one in the monitoring effort, were not selected for inclusion in the

modeling effort based on the absence of sulfate in the TRI data for the target facilities. A direct comparison between monitoring results and modeling results is not possible for these constituents.

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APPENDIX A
SUMMARY OF MOBILE LAB RESULTS

TABLE A-1
SUMMARY OF RECEPTOR CHRONIC HAZARDS
MOBILE LAB LOCATIONS
CHILD RECEPTOR, INHALATION PATHWAY

Chemical	Hazard Quotient			
	Corn Field	Kenova Fire Station	Kenova Water Works	Southpoint Ethanol
Benzene	5.5E-01	1.1E+00	3.5E-01	6.6E-01
Bromomethane	nc	2.8E-01	nc	nc
sec-Butylbenzene	4.5E-02	4.7E-02	nc	nc
tert-Butyl benzene	nc	4.0E-02	nc	nc
Carbon tetrachloride	6.8E-01	9.6E-01	nc	nc
Chloroethane	nc	1.3E-04	nc	nc
Chloromethane	1.7E-02	2.2E-02	7.2E-03	2.4E-02
1,4-Dichlorobenzene	nc	1.8E-03	nc	nc
Dichlorodifluoromethane	1.9E-01	1.7E-01	1.8E-01	nc
Dichloromethane	nc	4.7E-04	nc	nc
Hexachlorobutadiene	nc	1.9E+00	nc	nc
Isoproplybenzene (Cumene)	1.0E-02	nc	nc	nc
Naphthalene	9.9E-01	1.2E+00	4.4E-01	4.3E-01
n-Propylbenzene	nc	5.4E-02	nc	9.4E-02
Tetrachloroethene	3.1E-03	3.1E-03	nc	nc
Toluene	nc	4.6E-02	nc	1.8E-02
1,2,4-Trimethylbenzene	3.0E-01	8.8E-01	nc	3.6E-01
1,3,5-Trimethylbenzene	2.4E-01	3.5E-01	nc	2.4E-01
TOTAL	3.0E+00	7.1E+00	9.7E-01	1.8E+00

Notes: nc-- Not a COPC for listed station

TABLE A-2
SUMMARY OF RECEPTOR CHRONIC HAZARDS
MOBILE LAB LOCATIONS
ADULT RECEPTOR, INHALATION PATHWAY

Chemical	Hazard Quotient			
	Corn Field	Kenova Fire Station	Kenova Water Works	Southpoint Ethanol
Benzene	2.0E-01	4.0E-01	1.3E-01	2.4E-01
Bromomethane	nc	9.9E-02	nc	nc
sec-Butylbenzene	1.6E-02	1.7E-02	nc	nc
tert-Butyl benzene	nc	1.4E-02	nc	nc
Carbon tetrachloride	2.4E-01	3.4E-01	nc	nc
Chloroethane	nc	4.8E-05	nc	nc
Chloromethane	6.2E-03	7.8E-03	2.6E-03	8.4E-03
1,4-Dichlorobenzene	nc	6.3E-04	nc	nc
Dichlorodifluoromethane	6.7E-02	6.2E-02	6.3E-02	nc
Dichloromethane	nc	1.7E-04	nc	nc
Hexachlorobutadiene	nc	6.9E-01	nc	nc
Isoproplybenzene (Cumene)	3.6E-03	nc	nc	nc
Naphthalene	3.6E-01	4.3E-01	1.6E-01	1.5E-01
n-Proplybenzene	nc	1.9E-02	nc	3.3E-02
Tetrachloroethene	1.1E-03	1.1E-03	nc	nc
Toluene	nc	1.7E-02	nc	6.4E-03
1,2,4-Trimethylbenzene	1.1E-01	3.1E-01	nc	1.3E-01
1,3,5-Trimethylbenzene	8.5E-02	1.2E-01	nc	8.6E-02
TOTAL	1.1E+00	2.5E+00	3.5E-01	6.5E-01

Notes: nc-- Not a COPC for listed station

TABLE A-3
SUMMARY OF RECEPTOR CHRONIC RISKS
MOBILE LAB LOCATIONS
CHILD RECEPTOR, INHALATION PATHWAY

Chemical	Cancer Risks			
	Corn Field	Kenova Fire Station	Kenova Water Works	Southpoint Ethanol
Benzene	2.3E-06	4.7E-06	1.5E-06	2.8E-06
Carbon tetrachloride	1.8E-06	2.5E-06	nc	nc
Chloroethane	nc	9.7E-08	nc	nc
Chloromethane	4.5E-07	5.6E-07	1.9E-07	6.1E-07
1,4-Dichlorobenzene	nc	7.6E-07	nc	nc
Dichloromethane	nc	5.7E-08	nc	nc
Hexachlorobutadiene	nc	2.6E-06	nc	nc
Tetrachloroethene	7.4E-08	7.4E-08	nc	nc
TOTAL	4.6E-06	1.1E-05	1.7E-06	3.4E-06

Notes: nc-- Not a COPC for listed station

TABLE A-4
SUMMARY OF RECEPTOR CHRONIC RISKS
MOBILE LAB LOCATIONS
ADULT RECEPTOR, INHALATION PATHWAY

Chemical	Cancer Risks			
	Corn Field	Kenova Fire Station	Kenova Water Works	Southpoint Ethanol
Benzene	3.3E-06	6.7E-06	2.1E-06	4.0E-06
Carbon tetrachloride	2.5E-06	3.6E-06	nc	nc
Chloroethane	nc	1.4E-07	nc	nc
Chloromethane	6.4E-07	8.0E-07	2.6E-07	8.7E-07
1,4-Dichlorobenzene	nc	1.1E-06	nc	nc
Dichloromethane	nc	8.1E-08	nc	nc
Hexachlorobutadiene	nc	3.7E-06	nc	nc
Tetrachloroethene	1.1E-07	1.1E-07	nc	nc
TOTAL	6.6E-06	1.6E-05	2.4E-06	4.8E-06

Notes: nc-- Not a COPC for listed station

TABLE A-5
SUMMARY OF RECEPTOR CHRONIC RISKS
MOBILE LAB LOCATIONS
LIFETIME RECEPTOR, INHALATION PATHWAY

Chemical	Cancer Risks			
	Corn Field	Kenova Fire Station	Kenova Water Works	Southpoint Ethanol
Benzene	5.7E-06	1.1E-05	3.6E-06	6.8E-06
Carbon tetrachloride	4.3E-06	6.0E-06	nc	nc
Chloroethane	nc	2.3E-07	nc	nc
Chloromethane	1.1E-06	1.4E-06	4.5E-07	1.5E-06
1,4-Dichlorobenzene	nc	1.8E-06	nc	nc
Dichloromethane	nc	1.4E-07	nc	nc
Hexachlorobutadiene	nc	6.3E-06	nc	nc
Tetrachloroethene	1.8E-07	1.8E-07	nc	nc
TOTAL	1.1E-05	2.8E-05	4.1E-06	8.2E-06

Notes: nc-- Not a COPC for listed station

APPENDIX B
COMPARISON OF HAZARD INDEX SEGREGATION

TABLE B-1
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
CENTENNIAL DRIVE- REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	3.8E+00						
Chloromethane	1.5E-02						
Dichloromethane			1.7E-03				
Naphthalene		7.4E-01					
Toluene	6.5E-02						
1,2,4-Trimethylbenzene	3.5E-01						
Hydrochloric acid (gaseous)		4.8E-01					
Aluminum	1.9E-01						
Cadmium				6.8E-02			
Chromium		1.0E-01					
Lead							
Manganese	1.4E+00						
Nickel		2.5E-04					
HI Segregated by Target Organ	5.8E+00	1.3E+00	1.7E-03	6.8E-02	0.0E+00	0.0E+00	0.00E+00
Total HI	7.2E+00						

Chemical	MODELING DATA TASK 1						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		2.8E-03					
Antimony						2.0E-02	
Arsenic		2.4E-03					
Benzene	4.1E-01						
Carbon Tetrachloride			3.4E-02				
Chlorine		1.8E+00					
Furfural		9.4E-03					
Hydrogen chloride		4.3E-02					
Naphthalene		5.6E-02					
Nickel	9.1E-04						
1,2,4-Trimethylbenzne	7.4E-02						
Toluene	6.7E-03						
HI Segregated by Target Organ	4.9E-01	1.9E+00	3.4E-02	0.0E+00	0.0E+00	2.0E-02	0.00E+00
Total HI	2.5E+00						

Chemical	MODELING DATA TASK 3						
	Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		2.8E-03					
Antimony						2.0E-02	
Arsenic		2.4E-03					
Benzene	4.1E-01						
Carbon Tetrachloride			3.4E-02				
Chlorine		1.8E+00					
Furfural		9.4E-03					
Hydrogen chloride							
Naphthalene		5.6E-02					
Nickel		9.1E-04					
1,2,4-Trimethylbenzne	7.4E-02						
Toluene	6.7E-03						
HI Segregated by Target Organ	4.9E-01	1.9E+00	3.4E-02	0.0E+00	0.0E+00	2.0E-02	0.00E+00
Total HI	2.4E+00						

TABLE B-2
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
CORN FIELD- REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	2.0E+00						
Chloromethane	1.6E-02						
Dichloromethane			1.1E-03				
Naphthalene		9.8E-01					
Toluene							
1,2,4-Trimethylbenzene	3.3E-01						
Hydrochloric acid (gaseous)		4.2E-01					
Aluminum	1.9E-01						
Cadmium				6.0E-02			
Chromium		8.2E-02					
Lead							
Manganese	2.7E+00						
Nickel		2.2E-04					
HI Segregated by Target Organ	5.2E+00	1.5E+00	1.1E-03	6.0E-02	0.0E+00	0.0E+00	0.0E+00
Total HI	6.8E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		3.0E-03					
Antimony						5.0E-02	
Arsenic		4.4E-03					
Benzene	6.2E-01						
Carbon Tetrachloride			1.7E-01				
Chlorine		4.2E+00					
Furfural		1.1E-02					
Hydrogen chloride		2.1E-02					
Naphthalene		8.7E-02					
Nickel	1.8E-03						
1,2,4-Trimethylbenzne	1.9E-01						
Toluene	1.6E-02						
HI Segregated by Target Organ	8.3E-01	4.3E+00	1.7E-01	0.0E+00	0.0E+00	5.0E-02	0.0E+00
Total HI	5.3E+00						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		3.0E-03					
Antimony						5.0E-02	
Arsenic		4.4E-03					
Benzene	6.2E-01						
Carbon Tetrachloride			1.7E-01				
Chlorine		4.2E+00					
Furfural		1.1E-02					
Hydrogen chloride							
Naphthalene		8.7E-02					
Nickel		1.8E-03					
1,2,4-Trimethylbenzne	1.9E-01						
Toluene	1.6E-02						
HI Segregated by Target Organ	8.3E-01	4.3E+00	1.7E-01	0.0E+00	0.0E+00	5.0E-02	0.0E+00
Total HI	5.3E+00						

TABLE B-3
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
KENOVA FIRE STATION- REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	5.2E+00						
Chloromethane	1.5E-02						
Dichlorodifluoromethane							1.8E-01
Dichloromethane			2.6E-03				
Naphthalene		7.8E-01					
Toluene							
1,2,4-Trimethylbenzene	6.1E-01						
1,3,5-Trimethylbenzene	2.8E-01						
Hydrochloric acid (gaseous)		4.2E-01					
Aluminum	2.0E-01						
Arsenic		1.2E-02					
Barium		1.5E-01					
Cadmium				8.9E-02			
Chromium		1.4E-01					
Lead							
Manganese	2.1E+00						
Nickel		3.2E-04					
HI Segregated by Target Organ	8.4E+00	1.5E+00	2.6E-03	8.9E-02	0.0E+00	0.0E+00	1.8E-01
Total HI	1.0E+01						

Chemical	MODELING DATA TASK 1						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.9E-03					
Antimony						1.1E-02	
Arsenic		1.6E-03					
Benzene	1.5E-01						
Carbon Tetrachloride			9.8E-03				
Chlorine		6.4E-01					
Furfural		3.0E-03					
Hydrogen chloride		2.2E-02					
Naphthalene		2.6E-02					
Nickel	5.8E-04						
1,2,4-Trimethylbenzne	2.1E-02						
Toluene	2.3E-03						
HI Segregated by Target Organ	1.7E-01	6.9E-01	9.8E-03	0.0E+00	0.0E+00	1.1E-02	0.0E+00
Total HI	8.9E-01						

Chemical	MODELING DATA TASK 3						
	Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.9E-03					
Antimony						1.1E-02	
Arsenic		1.6E-03					
Benzene	1.5E-01						
Carbon Tetrachloride			9.8E-03				
Chlorine		6.4E-01					
Furfural		3.0E-03					
Hydrogen chloride							
Naphthalene		2.6E-02					
Nickel	5.8E-04						
1,2,4-Trimethylbenzne	2.1E-02						
Toluene	2.3E-03						
HI Segregated by Target Organ	1.7E-01	6.7E-01	9.8E-03	0.0E+00	0.0E+00	1.1E-02	0.0E+00
Total HI	8.6E-01						

TABLE B-4
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
KENOVA WATER WORKS - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	8.5E-01						
Bromomethane							
Chloromethane	2.2E-02						
Dichlorodifluoromethane							
Dichloromethane			3.7E-03				
Naphthalene		6.5E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		4.2E-01					
Aluminum	2.5E-01						
Arsenic							
Barium		2.2E-01					
Cadmium				4.9E-02			
Chromium		6.1E-02					
Lead							
Manganese	1.2E+00						
Nickel		3.2E-04					
HI Segregated by Target Organ	2.3E+00	1.4E+00	3.7E-03	4.9E-02	0.0E+00	0.0E+00	0.0E+00
Total HI	3.7E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.0E-04					
Antimony						7.0E-03	
Arsenic		7.0E-04					
Benzene	9.7E-02						
Carbon Tetrachloride			2.7E-03				
Chlorine		3.3E-01					
Furfural		1.8E-03					
Hydrogen chloride		3.8E-01					
Naphthalene		3.0E-02					
Nickel	2.6E-04						
1,2,4-Trimethylbenzne	9.5E-03						
Toluene	1.4E-03						
HI Segregated by Target Organ	1.1E-01	7.5E-01	2.7E-03	0.0E+00	0.0E+00	7.0E-03	0.0E+00
Total HI	8.6E-01						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.0E-04					
Antimony						7.0E-03	
Arsenic		7.0E-04					
Benzene	9.7E-02						
Carbon Tetrachloride			2.7E-03				
Chlorine		3.3E-01					
Furfural		1.8E-03					
Hydrogen chloride							
Naphthalene		3.0E-02					
Nickel	2.6E-04						
1,2,4-Trimethylbenzne	9.5E-03						
Toluene	1.4E-03						
HI Segregated by Target Organ	1.1E-01	3.7E-01	2.7E-03	0.0E+00	0.0E+00	7.0E-03	0.0E+00
Total HI	4.8E-01						

TABLE B-5
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
LOCKWOOD ESTATES - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	5.0E-01						
Bromomethane					3.5E-01		
Chloromethane	2.2E-02						
Dichlorodifluoromethane							
Dichloromethane			7.8E-04				
Naphthalene		7.6E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)							
Aluminum	1.8E-01						
Arsenic		1.3E-02					
Barium							
Cadmium				5.1E-02			
Chromium		7.6E-02					
Lead							
Manganese	8.1E-01						
Nickel		2.2E-04					
HI Segregated by Target Organ	1.5E+00	8.5E-01	7.8E-04	5.1E-02	3.5E-01	0.0E+00	0.0E+00
Total HI	2.8E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		3.7E-04					
Antimony						3.6E-03	
Arsenic		4.1E-04					
Benzene	4.1E-02						
Carbon Tetrachloride			1.2E-03				
Chlorine		1.5E-01					
Furfural		7.5E-04					
Hydrogen chloride		4.6E-02					
Naphthalene		1.3E-02					
Nickel	1.5E-04						
1,2,4-Trimethylbenzne	4.2E-03						
Toluene	5.9E-04						
HI Segregated by Target Organ	4.6E-02	2.1E-01	1.2E-03	0.0E+00	0.0E+00	3.6E-03	0.0E+00
Total HI	2.6E-01						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		3.7E-04					
Antimony						3.6E-03	
Arsenic		4.1E-04					
Benzene	4.1E-02						
Carbon Tetrachloride			1.2E-03				
Chlorine		1.5E-01					
Furfural		7.5E-04					
Hydrogen chloride							
Naphthalene		1.3E-02					
Nickel	1.5E-04						
1,2,4-Trimethylbenzne	4.2E-03						
Toluene	5.9E-04						
HI Segregated by Target Organ	4.6E-02	1.6E-01	1.2E-03	0.0E+00	0.0E+00	3.6E-03	0.0E+00
Total HI	2.1E-01						

TABLE B-6
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE CHILD RECEPTOR
SWEET RUN - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	1.1E+00						
Bromomethane							
Chloromethane	2.4E-02						
Dichlorodifluoromethane							
Dichloromethane			2.2E-01				
Naphthalene		8.1E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		3.4E-01					
Aluminum	1.8E-01						
Arsenic							
Barium		3.1E-01					
Cadmium				5.4E-02			
Chromium		6.6E-02					
Lead							
Manganese	8.5E-01						
Nickel		1.9E-04					
HI Segregated by Target Organ	2.2E+00	1.5E+00	2.2E-01	5.4E-02	0.0E+00	0.0E+00	0.0E+00
Total HI	4.0E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.8E-03					
Antimony						2.1E-02	
Arsenic		2.0E-03					
Benzene	3.8E-01						
Carbon Tetrachloride			1.5E-02				
Chlorine		1.4E+00					
Furfural		8.8E-03					
Hydrogen chloride		6.7E-02					
Naphthalene		8.0E-02					
Nickel	7.8E-04						
1,2,4-Trimethylbenzne	4.6E-02						
Toluene	5.3E-03						
HI Segregated by Target Organ	4.4E-01	1.6E+00	1.5E-02	0.0E+00	0.0E+00	2.1E-02	0.0E+00
Total HI	2.0E+00						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.8E-03					
Antimony						2.1E-02	
Arsenic		2.0E-03					
Benzene	3.8E-01						
Carbon Tetrachloride			1.5E-02				
Chlorine		1.4E+00					
Furfural		8.8E-03					
Hydrogen chloride							
Naphthalene		8.0E-02					
Nickel	7.8E-04						
1,2,4-Trimethylbenzne	4.6E-02						
Toluene	5.3E-03						
HI Segregated by Target Organ	4.4E-01	1.5E+00	1.5E-02	0.0E+00	0.0E+00	2.1E-02	0.0E+00
Total HI	2.0E+00						

TABLE B-7
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
CENTENNIAL DRIVE - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	1.4E+00						
Bromomethane							
Chloromethane	5.3E-03						
Dichlorodifluoromethane							
Dichloromethane			6.1E-04				
Naphthalene		2.6E-01					
Toluene		2.3E-02					
1,2,4-Trimethylbenzene	1.3E-01						
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		1.7E-01					
Aluminum	6.7E-02						
Arsenic							
Barium							
Cadmium							
Chromium		3.6E-02					
Lead							
Manganese	5.0E-01						
Nickel		9.0E-05					
HI Segregated by Target Organ	2.1E+00	4.9E-01	6.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total HI	2.6E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.0E-03					
Antimony						7.2E-03	
Arsenic		8.6E-04					
Benzene	1.5E-01						
Carbon Tetrachloride			1.2E-02				
Chlorine		6.4E-01					
Furfural		3.4E-03					
Hydrogen chloride		2.6E-02					
Naphthalene		2.0E-02					
Nickel	3.2E-04						
1,2,4-Trimethylbenzne	2.6E-02						
Toluene	2.4E-03						
HI Segregated by Target Organ	1.7E-01	6.9E-01	1.2E-02	0.0E+00	0.0E+00	7.2E-03	0.0E+00
Total HI	8.9E-01						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.0E-03					
Antimony						7.2E-03	
Arsenic		8.6E-04					
Benzene	1.5E-01						
Carbon Tetrachloride			1.2E-02				
Chlorine		6.4E-01					
Furfural		3.4E-03					
Hydrogen chloride							
Naphthalene		2.0E-02					
Nickel	3.2E-04						
1,2,4-Trimethylbenzne	2.6E-02						
Toluene	2.4E-03						
HI Segregated by Target Organ	1.7E-01	6.7E-01	1.2E-02	0.0E+00	0.0E+00	7.2E-03	0.0E+00
Total HI	8.6E-01						

TABLE B-8
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
CORN FIELD - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	7.2E-01						
Bromomethane							
Chloromethane	5.8E-03						
Dichlorodifluoromethane							
Dichloromethane			3.8E-04				
Naphthalene		3.5E-01					
Toluene							
1,2,4-Trimethylbenzene	1.2E-01						
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		1.5E-01					
Aluminum	6.7E-02						
Arsenic							
Barium							
Cadmium				2.1E-02			
Chromium		2.9E-02					
Lead							
Manganese	9.5E-01						
Nickel		7.7E-05					
HI Segregated by Target Organ	1.9E+00	5.3E-01	3.8E-04	2.1E-02	0.0E+00	0.0E+00	0.0E+00
Total HI	2.4E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.1E-03					
Antimony						1.8E-02	
Arsenic		1.6E-03					
Benzene	2.2E-01						
Carbon Tetrachloride			6.0E-02				
Chlorine		1.5E+00					
Furfural		4.0E-03					
Hydrogen chloride		1.3E-02					
Naphthalene		3.1E-02					
Nickel	6.3E-04						
1,2,4-Trimethylbenzne	7.0E-02						
Toluene	5.5E-03						
HI Segregated by Target Organ	3.0E-01	1.5E+00	6.0E-02	0.0E+00	0.0E+00	1.8E-02	0.0E+00
Total HI	1.9E+00						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.1E-03					
Antimony						1.8E-02	
Arsenic		1.6E-03					
Benzene	2.2E-01						
Carbon Tetrachloride			6.0E-02				
Chlorine		1.5E+00					
Furfural		4.0E-03					
Hydrogen chloride							
Naphthalene		3.1E-02					
Nickel	6.3E-04						
1,2,4-Trimethylbenzne	7.0E-02						
Toluene	5.5E-03						
HI Segregated by Target Organ	3.0E-01	1.5E+00	6.0E-02	0.0E+00	0.0E+00	1.8E-02	0.0E+00
Total HI	1.9E+00						

TABLE B-9
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
KENOVA FIRE STATION - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	1.9E+00						
Bromomethane							
Chloromethane	5.5E-03						
Dichlorodifluoromethane							6.3E-02
Dichloromethane			9.2E-04				
Naphthalene		2.8E-01					
Toluene							
1,2,4-Trimethylbenzene	2.2E-01						
1,3,5-Trimethylbenzene	1.0E-01						
Hydrochloric acid (gaseous)		1.5E-01					
Aluminum	7.3E-02						
Arsenic	4.4E-03						
Barium	5.4E-02						
Cadmium				3.2E-02			
Chromium		5.1E-02					
Lead							
Manganese	7.4E-01						
Nickel		1.2E-04					
HI Segregated by Target Organ	3.1E+00	4.8E-01	9.2E-04	3.2E-02	0.0E+00	0.0E+00	6.3E-02
Total HI	3.7E+00						

Chemical	MODELING DATA TASK 1						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.7E-04					
Antimony						4.1E-03	
Arsenic		5.8E-04					
Benzene	5.2E-02						
Carbon Tetrachloride			3.5E-03				
Chlorine		2.3E-01					
Furfural		1.1E-03					
Hydrogen chloride		1.3E-02					
Naphthalene		9.4E-03					
Nickel	2.1E-04						
1,2,4-Trimethylbenzne	7.7E-03						
Toluene	8.2E-04						
HI Segregated by Target Organ	6.1E-02	2.5E-01	3.5E-03	0.0E+00	0.0E+00	4.1E-03	0.0E+00
Total HI	3.2E-01						

Chemical	MODELING DATA TASK 3						
	Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.7E-04					
Antimony						4.1E-03	
Arsenic		5.8E-04					
Benzene	5.2E-02						
Carbon Tetrachloride			3.5E-03				
Chlorine		2.3E-01					
Furfural		1.1E-03					
Hydrogen chloride							
Naphthalene		9.4E-03					
Nickel	2.1E-04						
1,2,4-Trimethylbenzne	7.7E-03						
Toluene	8.2E-04						
HI Segregated by Target Organ	6.1E-02	2.4E-01	3.5E-03	0.0E+00	0.0E+00	4.1E-03	0.0E+00
Total HI	3.1E-01						

TABLE B-10
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
KENOVA WATER WORKS - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	3.0E-01						
Bromomethane							
Chloromethane	7.7E-03						
Dichlorodifluoromethane							1.3E-03
Dichloromethane			9.2E-04				
Naphthalene		2.3E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		1.5E-01					
Aluminum	8.9E-02						
Arsenic							
Barium	7.8E-02						
Cadmium				1.8E-02			
Chromium		2.2E-02					
Lead							
Manganese	4.3E-01						
Nickel		1.2E-04					
HI Segregated by Target Organ	9.0E-01	4.0E-01	9.2E-04	1.8E-02	0.0E+00	0.0E+00	1.3E-03
Total HI	1.3E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		2.2E-04					
Antimony						2.5E-03	
Arsenic		2.5E-04					
Benzene	3.5E-02						
Carbon Tetrachloride			9.5E-04				
Chlorine		1.2E-01					
Furfural		6.5E-04					
Hydrogen chloride		2.4E-01					
Naphthalene		1.1E-02					
Nickel	9.3E-05						
1,2,4-Trimethylbenzne	3.4E-03						
Toluene	4.9E-04						
HI Segregated by Target Organ	3.9E-02	3.7E-01	9.5E-04	0.0E+00	0.0E+00	2.5E-03	0.0E+00
Total HI	4.1E-01						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		2.2E-04					
Antimony						2.5E-03	
Arsenic		2.5E-04					
Benzene	3.5E-02						
Carbon Tetrachloride			9.5E-04				
Chlorine		1.2E-01					
Furfural		6.5E-04					
Hydrogen chloride							
Naphthalene		1.1E-02					
Nickel	9.3E-05						
1,2,4-Trimethylbenzne	3.4E-03						
Toluene	4.9E-04						
HI Segregated by Target Organ	3.9E-02	1.3E-01	9.5E-04	0.0E+00	0.0E+00	2.5E-03	0.0E+00
Total HI	1.7E-01						

TABLE B-11
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
LOCKWOOD ESTATES - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	1.8E-01						
Bromomethane					1.2E-01		
Chloromethane	7.8E-03						
Dichlorodifluoromethane							
Dichloromethane			2.8E-04				
Naphthalene		2.7E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)							
Aluminum	6.5E-02						
Arsenic		4.5E-03					
Barium							
Cadmium				1.8E-02			
Chromium		2.7E-02					
Lead							
Manganese	2.9E-01						
Nickel		8.0E-05					
HI Segregated by Target Organ	5.4E-01	3.0E-01	2.8E-04	1.8E-02	1.2E-01	0.0E+00	0.0E+00
Total HI	9.8E-01						

Chemical	MODELING DATA TASK 1						
	Hazard Quotient						
	Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.3E-04					
Antimony						1.3E-03	
Arsenic		1.5E-04					
Benzene	1.5E-02						
Carbon Tetrachloride			4.1E-04				
Chlorine		5.3E-02					
Furfural		2.7E-04					
Hydrogen chloride		2.9E-02					
Naphthalene		4.6E-03					
Nickel	5.3E-05						
1,2,4-Trimethylbenzne	1.5E-03						
Toluene	2.1E-04						
HI Segregated by Target Organ	1.6E-02	8.7E-02	4.1E-04	0.0E+00	0.0E+00	1.3E-03	0.0E+00
Total HI	1.0E-01						

Chemical	MODELING DATA TASK 3						
	Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		1.3E-04					
Antimony						1.3E-03	
Arsenic		1.5E-04					
Benzene	1.5E-02						
Carbon Tetrachloride			4.1E-04				
Chlorine		5.3E-02					
Furfural		2.7E-04					
Hydrogen chloride							
Naphthalene		4.6E-03					
Nickel	5.3E-05						
1,2,4-Trimethylbenzne	1.5E-03						
Toluene	2.1E-04						
HI Segregated by Target Organ	1.6E-02	5.8E-02	4.1E-04	0.0E+00	0.0E+00	1.3E-03	0.0E+00
Total HI	7.6E-02						

TABLE B-12
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR THE ADULT RECEPTOR
SWEET RUN - REASONABLE MAXIMUM EXPOSURE

Chemical	MONITORING DATA Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Benzene	3.8E-01						
Bromomethane							
Chloromethane	8.4E-03						
Dichlorodifluoromethane							
Dichloromethane			8.0E-02				
Naphthalene		2.9E-01					
Toluene							
1,2,4-Trimethylbenzene							
1,3,5-Trimethylbenzene							
Hydrochloric acid (gaseous)		1.2E-01					
Aluminum	6.3E-02						
Arsenic							
Barium		1.1E-01					
Cadmium				1.9E-02			
Chromium		2.4E-02					
Lead							
Manganese	3.0E-01						
Nickel		6.9E-05					
HI Segregated by Target Organ	7.5E-01	5.4E-01	8.0E-02	1.9E-02	0.0E+00	0.0E+00	0.0E+00
Total HI	1.4E+00						

Chemical	MODELING DATA TASK 1 Hazard Quotient Target Organ						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.3E-04					
Antimony						7.5E-03	
Arsenic		7.2E-04					
Benzene	1.4E-01						
Carbon Tetrachloride			5.2E-03				
Chlorine		5.0E-01					
Furfural		3.1E-03					
Hydrogen chloride		4.1E-02					
Naphthalene		2.9E-02					
Nickel	2.8E-04						
1,2,4-Trimethylbenzne	1.7E-02						
Toluene	1.9E-03						
HI Segregated by Target Organ	1.6E-01	5.8E-01	5.2E-03	0.0E+00	0.0E+00	7.5E-03	0.0E+00
Total HI	7.5E-01						

Chemical	MODELING DATA TASK 3 Hazard Quotient						
	Nervous System	Respiratory System	Liver	Kidney	Gastrointestinal System	Vascular	Decreased Body or Organ Weight
Acrylic Acid		6.3E-04					
Antimony						7.5E-03	
Arsenic		7.2E-04					
Benzene	1.4E-01						
Carbon Tetrachloride			5.2E-03				
Chlorine		5.0E-01					
Furfural		3.1E-03					
Hydrogen chloride							
Naphthalene		2.9E-02					
Nickel	2.8E-04						
1,2,4-Trimethylbenzne	1.7E-02						
Toluene	1.9E-03						
HI Segregated by Target Organ	1.6E-01	5.4E-01	5.2E-03	0.0E+00	0.0E+00	7.5E-03	0.0E+00
Total HI	7.1E-01						

TABLES

TRI-STATE GEOGRAPHIC INITIATIVE

TABLE 2-1

SUMMARY OF SAMPLING CONDUCTED IN THE TRI-STATE KENOVA INDUSTRIAL CLUSTER AIR TOXICS MONITORING PROGRAM

Location	County, State	Latitude, Longitude Coordinates	Sampling Summary				
			Samples Taken	Sampler Type	Sampling Dates	Duration of Sample	Use of Samples in Risk Evaluation
Centennial Drive	Wayne, WV	38:23:33N 82:35:06W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
Corn Field	Wayne, WV	38:23:15N 82:36:01W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
			VOCs	Mobile Lab, direct analysis by GC	4/30/97 - 5/26/97	1 hour	Chronic, Acute

TRI-STATE GEOGRAPHIC INITIATIVE

TABLE 2-1

SUMMARY OF SAMPLING CONDUCTED IN THE TRI-STATE KENOVA INDUSTRIAL CLUSTER AIR TOXICS MONITORING PROGRAM

Location	County, State	Latitude, Longitude Coordinates	Sampling Summary				
			Samples Taken	Sampler Type	Sampling Dates	Duration of Sample	Use of Samples in Risk Evaluation
Kenova Fire Station	Wayne, WV	38:24:20N 82:34:48W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
			VOCs	Mobile Lab, direct analysis by GC	10/16/96 - 11/7/96 and 4/2/97 - 4/24/97	1 hour	Chronic, Acute
			VOCs	Trigger Detector, Summa Canister	22 times between 9/96 and 5/97	24 hours	Combined with the VOC results from the stationary sampler in the Chronic and Acute evaluations
Kenova Water Works	Wayne, WV	38:20:59N 82:35:51W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
			VOCs	Mobile Lab, direct analysis by GC	3/12/97 - 4/1/97	1 hour	Chronic, Acute

TRI-STATE GEOGRAPHIC INITIATIVE

TABLE 2-1

SUMMARY OF SAMPLING CONDUCTED IN THE TRI-STATE KENOVA INDUSTRIAL CLUSTER AIR TOXICS MONITORING PROGRAM

Location	County, State	Latitude, Longitude Coordinates	Sampling Summary				
			Samples Taken	Sampler Type	Sampling Dates	Duration of Sample	Use of Samples in Risk Evaluation
Lockwood Estates	Boyd, KY	38:19:52N 82:35:31W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
Sweet Run	Wayne, WV	38:21:46N 82:34:26W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
Webbville	Lawrence, KY	38:11:04N 82:52:22W	VOCs	SUMMA canisters	8/96 -7/97	24 hours	Chronic, Acute
			SVOCs	PUF samplers	6/96 -7/97	24 hours	Chronic, Acute
			Inorganic acids and bases	Annular Denuder Sampler	8/96 -7/97	24 hours	Chronic, Acute
			Metals	High Volume Sampler	6/96 -7/97	24 hours	Chronic, Acute
Southpoint Ethanol facility	Lawrence, OH	38:25:42N 82:34:56W	VOCs	Mobile Lab, direct analysis by GC	5/30/97 - 7/11/97	1 hour	Chronic, Acute

TABLE 2-2
MONITORING REPORT ANALYTES

Summa	PUF	Metals	Annular Denuder	Mobile-VOCs
Dichlorodifluoromethane	Acenaphthene	Aluminum	Nitric acid (gaseous)	Dichlorodifluoromethane
Trichlorofluoromethane	Acenaphthylene	Antimony	Nitrous acid (gaseous)	Chloromethane
Carbon Disulfide	Anthracene	Arsenic	Sulfur dioxide (gaseous)	Trichlorofluoro methane
1,1,1-Trichloroethane	Benzo(a)Anthracene	Barium	Ammonia (gaseous)	Carbon Tetrachloride
Benzene	Benzo(a)Pyrene	Beryllium	Hydrochloric acid (gaseous)	Benzene
Toluene	Benzo(b)Fluoranthene	Cadmium	Sulfate (particulate)	Toluene
1,3-Xylene & 1,4-Xylene	Benzo(g,h,I)Perylene	Calcium	Nitrate (particulate)	Ethyl benzene
Chloromethane	Benzo(k)Fluoranthene	Chromium	Ammonia (particulate)	1,2-Xylene
Dichloromethane	Chrysene	Cobalt	Hydronium ion	1,3-Xylene & 1,4-Xylene
1,2,4-Trichlorobenzene	Dibenz(a,h)Anthracene	Copper		1,2,4-Trimethyl benzene
Naphthalene	Fluoranthene	Iron		1,3,5-Trimethyl benzene
1,2,3-Trichlorobenzene	Fluorene	Lead		Tetrachloro ethene
1,2,4-Trimethylbenzene	Indeno(1,2,3-CD)Pyrene	Magnesium		Naphthalene
Ethylbenzene	Naphthalene	Manganese		Isoproply benzene (Cumene)
1,2-Xylene	Phenanthrene	Mercury		1,4-Dichloro benzene
Isopropyltoluene(Cymene)	Pyrene	Molybdenum		Dichloromethane
Styrene		Nickel		n-Proplybenzene
Bromomethane		Selenium		1,1,1-Trichloro ethane
1,3,5-Trimethylbenzene		Silver		n-Butylbenzene
Chlorobenzene		Strontium		tert-Butyl benzene
Isopropylbenzene(Cumene)		Thallium		Styrene
Tetrachloroethene		Tin		
1,3-Hexadien-5-yne		Vanadium		Bromoform
4-Methyl-2-pentene		Zinc		sec-Butylbenzene
1-Methylcyclopentene				CarbonDisulfide
Bromoform				Hexachloro butadiene
2,3-Dimethylpentane				Chloroethane
2,2,4,4-Tetramethylpentane				1,2,3-Trichloro benzene
2,3,4-Trimethypentane				Bromomethane
1,3,5-Cycloheptatriene				Isopropyltoluene (Cymene)
				2,2-Dichloro propane
				1,2,4-Trichloro benzene

TABLE 2-3
CHEMICALS MODELED IN MODELING REPORT

Chemical
Acrylic Acid
Ammonia
Anthracene
Antimony
Arsenic
Benzene
Biphenyl
1,3-Butadiene
Calcium Oxides
Carbon Tetrachloride
Chrysene
Chlorine
Cumene
Cyclohexane
Dichloromethane
Ethylbenzene
Ethylene
Furfural
n-Hexane
Hydrogen Fluoride
Hydrogen Chloride
Maleic Anhydride
Manganese
Methanol
Methyl Tertiary Butyl Ether (MTBE)
Naphthalene
Nickel
Nonane
Propylene
Styrene
1,1,1-Trichloroethane
Titanium Dioxide
1,2,4-Trimethylbenzene
Toluene
Xylene

TABLE 2-4
SUMMARY OF CHEMICALS OF POTENTIAL CONCERN
AIR MONITORING AND AIR MODELING RISK ASSESSMENTS

Monitoring COPCs		Modeling COPCs
Stationary Sampler	**Mobile Lab**	
Benzene	Benzene	Acrylic Acid
Bromomethane	Bromomethane	Benzene
Chloromethane	sec-Butylbenzene	1,3-Butadiene
Dichlorodifluoromethane	tert-Butyl benzene	Carbon Tetrachloride
Dichloromethane	Carbon tetrachloride	Furfural
Naphthalene	Chloroethane	Naphthalene
Toluene	Chloromethane	Toluene
1,2,4-Trimethylbenzene	1,4-Dichlorobenzene	1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene	Dichlorodifluoromethane	
	Dichloromethane	Chlorine
Hydrochloric acid (gaseous)	Hexachlorobutadiene	Hydrogen Chloride
Aluminum	Isoproplybenzene (Cumene)	Antimony
Arsenic	Naphthalene	Arsenic
Barium	n-Propylbenzene	Nickel
Beryllium	Tetrachloroethene	
Cadmium	Toluene	
Chromium	1,2,4-Trimethylbenzene	
Manganese	1,3,5-Trimethylbenzene	
Nickel		
Thallium		

TABLE 2-5
REASONABLE MAXIMUM EXPOSURE PARAMETERS
ADULT RESIDENT RECEPTOR

Parameter	Symbol	Value	Units	Reference
Exposure Frequency	EF	350	days/year	EPA (1991)
Exposure Duration	ED	24	years	EPA (1991)
Body Weight	BW	70	kg	EPA (1991)
Averaging Time				
Carcinogens	ATc	70	years	EPA (1988)
Noncarcinogens	ATn	24	years	Based on Exposure Duration
Inhalation Rate	IHR	20	m^3/day	EPA (1991)
Conversion Factor	CF3	1.00E+03	µg/mg	Not Applicable

TABLE 2-6
REASONABLE MAXIMUM EXPOSURE PARAMETERS
CHILD RESIDENT RECEPTOR

Parameter	Symbol	Value	Units	Reference
Exposure Frequency	EF	350	days/year	EPA (1991)
Exposure Duration	ED	6	years	EPA (1991)
Body Weight	BW	15	kg	EPA (1991)
Averaging Time				
Carcinogens	ATc	70	years	EPA (1988)
Noncarcinogens	ATn	6	years	Based on Exposure Duration
Inhalation Rate	IHR	12	m^3/day	EPA (1991)
Conversion Factor	CF3	1.00E+03	µg/mg	Not Applicable

TABLE 2-7
CENTRAL TENDENCY EXPOSURE PARAMETERS
ADULT RESIDENT RECEPTOR

Parameter	Symbol	Value	Units	Reference
Exposure Frequency	EF	234	days/year	EPA (1997)
Exposure Duration	ED	9	years	EPA (1997)-average time in one residence
Body Weight	BW	70	kg	EPA (1991)
Averaging Time				
Carcinogens	ATc	70	years	EPA (1988)
Noncarcinogens	ATn	9	years	Based on Exposure Duration
Inhalation Rate	IHR	15.2	m^3/day	EPA (1997)
Conversion Factor	CF3	1.00E+03	µg/mg	Not Applicable

TABLE 2-8
CENTRAL TENDENCY EXPOSURE PARAMETERS
CHILD RESIDENT RECEPTOR

Parameter	Symbol	Value	Units	Reference
Exposure Frequency	EF	234	days/year	EPA (1997)
Exposure Duration	ED	6	years	EPA (1997)-lower of years lived or average time in one residence
Body Weight	BW	15	kg	EPA (1991)
Averaging Time				
Carcinogens	ATc	70	years	EPA (1988)
Noncarcinogens	ATn	6	years	Based on Exposure Duration
Inhalation Rate	IHR	8.3	m^3/day	EPA (1997)
Conversion Factor	CF3	1.00E+03	µg/mg	Not Applicable

TABLE 2-9
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
CENTENNIAL DRIVE

MONITORING		MODELING		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	3.8E+00	Acrylic Acid	2.81E-03	2.81E-03
Bromomethane	nc	Antimony	2.03E-02	2.03E-02
Chloromethane	1.5E-02	Arsenic	2.40E-03	2.40E-03
Dichlorodifluoromethane	nc	Benzene	4.06E-01	4.06E-01
Dichloromethane	1.7E-03	Carbon Tetrachloride	3.44E-02	3.44E-02
Naphthalene	7.4E-01	Chlorine	1.80E+00	1.80E+00
Toluene	6.5E-02	Furfural	9.39E-03	9.39E-03
1,2,4-Trimethylbenzene	3.5E-01	Hydrogen Chloride	4.27E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	5.55E-02	5.55E-02
		Nickel	9.07E-04	9.07E-04
Hydrochloric acid (gaseous)	4.8E-01	1,2,4-Trimethylbenzene	7.36E-02	7.36E-02
Aluminum	1.9E-01	Toluene	6.68E-03	6.68E-03
Arsenic	nc			
Barium	nc			
Beryllium	nc			
Cadmium	6.8E-02			
Chromium	1.0E-01			
Manganese	1.4E+00			
Nickel	2.5E-04			
Thallium	nc			
TOTAL	7.2E+00	TOTAL	2.45E+00	2.41E+00

Notes: nc--Not a COPC for listed station

TABLE 2-10
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
CORN FIELD

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	2.0E+00	Benzene	5.5E-01	Acrylic Acid	3.02E-03	3.02E-03
Bromomethane	nc	Bromomethane	nc	Antimony	4.99E-02	4.99E-02
Chloromethane	1.6E-02	sec-Butylbenzene	4.5E-02	Arsenic	4.39E-03	4.39E-03
Dichlorodifluoromethane	nc	tert-Butyl benzene	nc	Benzene	6.16E-01	6.16E-01
Dichloromethane	1.1E-03	Carbon tetrachloride	6.8E-01	Carbon Tetrachloride	1.68E-01	1.68E-01
Naphthalene	9.8E-01	Chloroethane	nc	Chlorine	4.15E+00	4.15E+00
Toluene	nc	Chloromethane	1.7E-02	Furfural	1.10E-02	1.10E-02
1,2,4-Trimethylbenzene	3.3E-01	1,4-Dichlorobenzene	nc	Hydrogen Chloride	2.06E-02	nc
1,3,5-Trimethylbenzene	nc	Dichlorodifluoromethane	1.9E-01	Naphthalene	8.71E-02	8.71E-02
		Dichloromethane	nc	Nickel	1.76E-03	1.76E-03
Hydrochloric acid (gaseous)	4.2E-01	Hexachlorobutadiene	nc	1,2,4-Trimethylbenzene	1.94E-01	1.94E-01
Aluminum	1.9E-01	Isoproplybenzene (Cumene)	1.0E-02	Toluene	1.55E-02	1.55E-02
Arsenic	nc	Naphthalene	9.9E-01			
Barium	nc	n-Propylbenzene	nc			
Berylliium	nc	Tetrachloroethene	3.1E-03			
Cadmium	6.0E-02	Toluene	nc			
Chromium	8.2E-02	1,2,4-Trimethylbenzene	3.0E-01			
Manganese	2.7E+00	1,3,5-Trimethylbenzene	2.4E-01			
Nickel	2.2E-04					
Thallium	nc					
TOTAL	6.8E+00	TOTAL	3.0E+00	TOTAL	5.32E+00	5.30E+00

Notes: nc--Not a COPC for listed station

TABLE 2-11
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
KENOVA FIRE STATION

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	5.2E+00	Benzene	1.1E+00	Acrylic Acid	1.86E-03	1.86E-03
Bromomethane	nc	Bromomethane	2.8E-01	Antimony	1.14E-02	1.14E-02
Chloromethane	1.5E-02	sec-Butylbenzene	4.7E-02	Arsenic	1.64E-03	1.64E-03
Dichlorodifluoromethane	1.8E-01	tert-Butyl benzene	4.0E-02	Benzene	1.46E-01	1.46E-01
Dichloromethane	2.6E-03	Carbon tetrachloride	9.6E-01	Carbon Tetrachloride	9.79E-03	9.79E-03
Naphthalene	7.8E-01	Chloroethane	1.3E-04	Chlorine	6.40E-01	6.40E-01
Toluene	nc	Chloromethane	2.2E-02	Furfural	2.99E-03	2.99E-03
1,2,4-Trimethylbenzene	6.1E-01	1,4-Dichlorobenzene	1.8E-03	Hydrogen Chloride	2.18E-02	nc
1,3,5-Trimethylbenzene	2.8E-01	Dichlorodifluoromethane	1.7E-01	Naphthalene	2.64E-02	2.64E-02
		Dichloromethane	4.7E-04	Nickel	5.77E-04	5.77E-04
Hydrochloric acid (gaseous)	4.2E-01	Hexachlorobutadiene	1.9E+00	1,2,4-Trimethylbenzene	2.14E-02	2.14E-02
Aluminum	2.0E-01	Isoproplybenzene (Cumene)	nc	Toluene	2.30E-03	2.30E-03
Arsenic	1.2E-02	Naphthalene	1.2E+00			
Barium	1.5E-01	n-Propylbenzene	5.4E-02			
Beryllium	nc	Tetrachloroethene	3.1E-03			
Cadmium	8.9E-02	Toluene	4.6E-02			
Chromium	1.4E-01	1,2,4-Trimethylbenzene	8.8E-01			
Manganese	2.1E+00	1,3,5-Trimethylbenzene	3.5E-01			
Nickel	3.2E-04					
Thallium	nc					
TOTAL	1.0E+01	TOTAL	7.1E+00	TOTAL	8.85E-01	8.64E-01

Notes: nc--Not a COPC for listed station

TABLE 2-12
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
KENOVA WATER WORKS

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
		Benzene	3.5E-01			
Benzene	8.5E-01	Bromomethane	nc	Acrylic Acid	6.03E-04	6.03E-04
Bromomethane	nc	sec-Butylbenzene	nc	Antimony	7.04E-03	7.04E-03
Chloromethane	2.2E-02	tert-Butyl benzene	nc	Arsenic	7.00E-04	7.00E-04
Dichlorodifluoromethane	nc	Carbon tetrachloride	nc	Benzene	9.74E-02	9.74E-02
Dichloromethane	3.7E-03	Chloroethane	nc	Carbon Tetrachloride	2.65E-03	2.65E-03
Naphthalene	6.5E-01	Chloromethane	7.2E-03	Chlorine	3.33E-01	3.33E-01
Toluene	nc	1,4-Dichlorobenzene	nc	Furfural	1.81E-03	1.81E-03
1,2,4-Trimethylbenzene	nc	Dichlorodifluoromethane	1.8E-01	Hydrogen Chloride	3.80E-01	nc
1,3,5-Trimethylbenzene	nc	Dichloromethane	nc	Naphthalene	3.00E-02	3.00E-02
		Hexachlorobutadiene	nc	Nickel	2.62E-04	2.62E-04
Hydrochloric acid (gaseous)	4.2E-01	Isopropylbenzene (Cumene)	nc	1,2,4-Trimethylbenzene	9.51E-03	9.51E-03
Aluminum	2.5E-01	Naphthalene	4.4E-01	Toluene	1.36E-03	1.36E-03
Arsenic	nc	n-Propylbenzene	nc			
Barium	2.2E-01	Tetrachloroethene	nc			
Beryllium	nc	Toluene	nc			
Cadmium	4.9E-02	1,2,4-Trimethylbenzene	nc			
Chromium	6.1E-02	1,3,5-Trimethylbenzene	nc			
Manganese	1.2E+00					
Nickel	3.2E-04					
Thallium	nc					
TOTAL	3.7E+00	TOTAL	9.7E-01	TOTAL	8.64E-01	4.84E-01

Notes: nc--Not a COPC for listed station

TABLE 2-13
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
LOCKWOOD ESTATES

MONITORING		MODELING		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	5.0E-01	Acrylic Acid	3.65E-04	3.65E-04
Bromomethane	3.5E-01	Antimony	3.61E-03	3.61E-03
Chloromethane	2.2E-02	Arsenic	4.11E-04	4.11E-04
Dichlorodifluoromethane	nc	Benzene	4.12E-02	4.12E-02
Dichloromethane	7.8E-04	Carbon Tetrachloride	1.15E-03	1.15E-03
Naphthalene	7.6E-01	Chlorine	1.48E-01	1.48E-01
Toluene	nc	Furfural	7.51E-04	7.51E-04
1,2,4-Trimethylbenzene	nc	Hydrogen Chloride	4.63E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	1.28E-02	1.28E-02
		Nickel	1.48E-04	1.48E-04
Hydrochloric acid (gaseous)	nc	1,2,4-Trimethylbenzene	4.21E-03	4.21E-03
Aluminum	1.8E-01	Toluene	5.88E-04	5.88E-04
Arsenic	1.3E-02			
Barium	nc			
Beryllium	nc			
Cadmium	5.1E-02			
Chromium	7.6E-02			
Manganese	8.1E-01			
Nickel	2.2E-04			
Thallium	nc			
TOTAL	2.8E+00	TOTAL	2.60E-01	2.13E-01

Notes: nc–Not a COPC for listed station

TABLE 2-14
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR CHILD RECEPTOR, RME
SWEET RUN

MONITORING		MODELING		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	1.1E+00	Acrylic Acid	1.77E-03	1.77E-03
Bromomethane	nc	Antimony	2.10E-02	2.10E-02
Chloromethane	2.4E-02	Arsenic	2.01E-03	2.01E-03
Dichlorodifluoromethane	nc	Benzene	3.83E-01	3.83E-01
Dichloromethane	2.2E-01	Carbon Tetrachloride	1.47E-02	1.47E-02
Naphthalene	8.1E-01	Chlorine	1.41E+00	1.41E+00
Toluene	nc	Furfural	8.78E-03	8.78E-03
1,2,4-Trimethylbenzene	nc	Hydrogen Chloride	6.65E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	7.98E-02	7.98E-02
		Nickel	7.84E-04	7.84E-04
Hydrochloric acid (gaseous)	3.4E-01	1,2,4-Trimethylbenzene	4.61E-02	4.61E-02
Aluminum	1.8E-01	Toluene	5.25E-03	5.25E-03
Arsenic	nc			
Barium	3.1E-01			
Beryllium	nc			
Cadmium	5.4E-02			
Chromium	6.6E-02			
Manganese	8.5E-01			
Nickel	1.9E-04			
Thallium	nc			
TOTAL	3.9E+00	TOTAL	2.04E+00	1.97E+00

Notes: nc--Not a COPC for listed station

TABLE 2-15
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR ADULT RECEPTOR, RME
CENTENNIAL DRIVE

Air Monitoring Results		Air Modeling Results		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	1.4E+00	Acrylic Acid	1.01E-03	1.01E-03
Bromomethane	nc	Antimony	7.24E-03	7.24E-03
Chloromethane	5.3E-03	Arsenic	8.57E-04	8.57E-04
Dichlorodifluoromethane	nc	Benzene	1.45E-01	1.45E-01
Dichloromethane	6.1E-04	Carbon Tetrachloride	1.23E-02	1.23E-02
Naphthalene	2.6E-01	Chlorine	6.42E-01	6.42E-01
Toluene	2.3E-02	Furfural	3.35E-03	3.35E-03
1,2,4-Trimethylbenzene	1.3E-01	Hydrogen Chloride	2.64E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	1.98E-02	1.98E-02
		Nickel	3.24E-04	3.24E-04
Hydrochloric acid (gaseous)	1.7E-01	1,2,4-Trimethylbenzene	2.63E-02	2.63E-02
Aluminum	6.7E-02	Toluene	2.39E-03	2.39E-03
Arsenic	nc			
Barium	nc			
Beryllium	nc			
Cadmium	2.4E-02			
Chromium	3.6E-02			
Manganese	5.0E-01			
Nickel	9.0E-05			
Thallium	nc			
TOTAL	2.6E+00	TOTAL	8.87E-01	8.61E-01

Notes: nc-- Not a COPC for listed station

TABLE 2-16
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR ADULT RECEPTOR, RME
Corn Field

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	7.2E-01	Benzene	2.0E-01	Acrylic Acid	1.08E-03	1.08E-03
Bromomethane	nc	Bromomethane	nc	Antimony	1.78E-02	1.78E-02
Chloromethane	5.8E-03	sec-Butylbenzene	1.6E-02	Arsenic	1.57E-03	1.57E-03
Dichlorodifluoromethane	nc	tert-Butyl benzene	nc	Benzene	2.20E-01	2.20E-01
Dichloromethane	3.8E-04	Carbon tetrachloride	2.4E-01	Carbon Tetrachloride	6.01E-02	6.01E-02
Naphthalene	3.5E-01	Chloroethane	nc	Chlorine	1.48E+00	1.48E+00
Toluene	nc	Chloromethane	6.2E-03	Furfural	3.95E-03	3.95E-03
1,2,4-Trimethylbenzene	1.2E-01	1,4-Dichlorobenzene	nc	Hydrogen Chloride	1.27E-02	nc
1,3,5-Trimethylbenzene	nc	Dichlorodifluoromethane	6.7E-02	Naphthalene	3.11E-02	3.11E-02
		Dichloromethane	nc	Nickel	6.29E-04	6.29E-04
Hydrochloric acid (gaseous)	1.5E-01	Hexachlorobutadiene	nc	1,2,4-Trimethylbenzene	6.95E-02	6.95E-02
Aluminum	6.7E-02	Isoproplybenzene (Cumene)	3.6E-03	Toluene	5.52E-03	5.52E-03
Arsenic	nc	Naphthalene	3.6E-01			
Barium	nc	n-Proplybenzene	nc			
Beryllium	nc	Tetrachloroethene	1.1E-03			
Cadmium	2.1E-02	Toluene	nc			
Chromium	2.9E-02	1,2,4-Trimethylbenzene	1.1E-01			
Manganese	9.5E-01	1,3,5-Trimethylbenzene	8.5E-02			
Nickel	7.7E-05					
Thallium	nc					
TOTAL	2.4E+00	TOTAL	1.1E+00		1.91E+00	1.89E+00

Notes: nc-- Not a COPC for listed station

TABLE 2-17
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER FOR ADULT RECEPTOR, RME
Kenova Fire Station

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	1.9E+00	Benzene	4.0E-01	Acrylic Acid	6.65E-04	6.65E-04
Bromomethane	nc	Bromomethane	9.9E-02	Antimony	4.07E-03	4.07E-03
Chloromethane	5.5E-03	sec-Butylbenzene	1.7E-02	Arsenic	5.84E-04	5.84E-04
Dichlorodifluoromethane	6.3E-02	tert-Butyl benzene	1.4E-02	Benzene	5.20E-02	5.20E-02
Dichloromethane	9.2E-04	Carbon tetrachloride	3.4E-01	Carbon Tetrachloride	3.50E-03	3.50E-03
Naphthalene	2.8E-01	Chloroethane	4.8E-05	Chlorine	2.28E-01	2.28E-01
Toluene	nc	Chloromethane	7.8E-03	Furfural	1.07E-03	1.07E-03
1,2,4-Trimethylbenzene	2.2E-01	1,4-Dichlorobenzene	6.3E-04	Hydrogen Chloride	1.34E-02	nc
1,3,5-Trimethylbenzene	1.0E-01	Dichlorodifluoromethane	6.2E-02	Naphthalene	9.42E-03	9.42E-03
		Dichloromethane	1.7E-04	Nickel	2.06E-04	2.06E-04
Hydrochloric acid (gaseous)	1.5E-01	Hexachlorobutadiene	6.9E-01	1,2,4-Trimethylbenzene	7.66E-03	7.66E-03
Aluminum	7.3E-02	Isoproplybenzene (Cumene)	nc	Toluene	8.21E-04	8.21E-04
Arsenic	4.4E-03	Naphthalene	4.3E-01			
Barium	5.4E-02	n-Proplybenzene	1.9E-02			
Beryllium	nc	Tetrachloroethene	1.1E-03			
Cadmium	3.2E-02	Toluene	1.7E-02			
Chromium	5.1E-02	1,2,4-Trimethylbenzene	3.1E-01			
Manganese	7.4E-01	1,3,5-Trimethylbenzene	1.2E-01			
Nickel	1.2E-04					
Thallium	nc					
TOTAL	3.6E+00	TOTAL	2.5E+00	**Total**	3.22E-01	3.08E-01

Notes: nc-- Not a COPC for listed station

TABLE 2-18
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR ADULT RECEPTOR, RME
Kenova Water Works

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Hazard Quotient	
Chemical	Hazard Quotient	Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	3.0E-01	Benzene	1.3E-01	Acrylic Acid	2.15E-04	2.15E-04
Bromomethane	nc	Bromomethane	nc	Antimony	2.52E-03	2.52E-03
Chloromethane	7.7E-03	sec-Butylbenzene	nc	Arsenic	2.50E-04	2.50E-04
Dichlorodifluoromethane	1.3E-03	tert-Butyl benzene	nc	Benzene	3.48E-02	3.48E-02
Dichloromethane	nc	Carbon tetrachloride	nc	Carbon Tetrachloride	9.47E-04	9.47E-04
Naphthalene	2.3E-01	Chloroethane	nc	Chlorine	1.19E-01	1.19E-01
Toluene	nc	Chloromethane	2.6E-03	Furfural	6.45E-04	6.45E-04
1,2,4-Trimethylbenzene	nc	1,4-Dichlorobenzene	nc	Hydrogen Chloride	2.35E-01	nc
1,3,5-Trimethylbenzene	nc	Dichlorodifluoromethane	6.3E-02	Naphthalene	1.07E-02	1.07E-02
		Dichloromethane	nc	Nickel	9.34E-05	9.34E-05
Hydrochloric acid (gaseous)	1.5E-01	Hexachlorobutadiene	nc	1,2,4-Trimethylbenzene	3.40E-03	3.40E-03
Aluminum	8.9E-02	Isoproplybenzene (Cumene)	nc	Toluene	4.86E-04	4.86E-04
Arsenic	nc	Naphthalene	1.6E-01			
Barium	7.8E-02	n-Proplybenzene	nc			
Beryllium	nc	Tetrachloroethene	nc			
Cadmium	1.8E-02	Toluene	nc			
Chromium	2.2E-02	1,2,4-Trimethylbenzene	nc			
Manganese	4.3E-01	1,3,5-Trimethylbenzene	nc			
Nickel	1.2E-04					
Thallium	nc					
TOTAL	1.3E+00	TOTAL	3.5E-01	TOTAL	4.08E-01	1.73E-01

Notes: nc-- Not a COPC for listed station

TABLE 2-19
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR ADULT RECEPTOR, RME
Lockwood Estates

Air Monitoring Results		Air Modeling Results		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	1.8E-01	Acrylic Acid	1.31E-04	1.31E-04
Bromomethane	1.2E-01	Antimony	1.29E-03	1.29E-03
Chloromethane	7.8E-03	Arsenic	1.47E-04	1.47E-04
Dichlorodifluoromethane	nc	Benzene	1.47E-02	1.47E-02
Dichloromethane	2.8E-04	Carbon Tetrachloride	4.12E-04	4.12E-04
Naphthalene	2.7E-01	Chlorine	5.29E-02	5.29E-02
Toluene	nc	Furfural	2.68E-04	2.68E-04
1,2,4-Trimethylbenzene	nc	Hydrogen Chloride	2.86E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	4.57E-03	4.57E-03
		Nickel	5.29E-05	5.29E-05
Hydrochloric acid (gaseous)	nc	1,2,4-Trimethylbenzene	1.51E-03	1.51E-03
Aluminum	6.5E-02	Toluene	2.10E-04	2.10E-04
Arsenic	4.5E-03			
Barium	nc			
Beryllium	nc			
Cadmium	1.8E-02			
Chromium	2.7E-02			
Manganese	2.9E-01			
Nickel	8.0E-05			
Thallium	nc			
TOTAL	9.9E-01	TOTAL	1.05E-01	7.62E-02

Notes: nc– Not a COPC for listed station

TABLE 2-20
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
NONCANCER RISKS FOR ADULT RECEPTOR, RME
Sweet Run

Air Monitoring Results		Air Modeling Results		
			Hazard Quotient	
Chemical	Hazard Quotient	Chemical	TASK 1	TASK 3
Benzene	3.8E-01	Acrylic Acid	6.31E-04	6.31E-04
Bromomethane	nc	Antimony	7.52E-03	7.52E-03
Chloromethane	8.4E-03	Arsenic	7.16E-04	7.16E-04
Dichlorodifluoromethane	nc	Benzene	1.37E-01	1.37E-01
Dichloromethane	8.0E-02	Carbon Tetrachloride	5.24E-03	5.24E-03
Naphthalene	2.9E-01	Chlorine	5.04E-01	5.04E-01
Toluene	nc	Furfural	3.14E-03	3.14E-03
1,2,4-Trimethylbenzene	nc	Hydrogen Chloride	4.11E-02	nc
1,3,5-Trimethylbenzene	nc	Naphthalene	2.85E-02	2.85E-02
		Nickel	2.80E-04	2.80E-04
Hydrochloric acid (gaseous)	1.2E-01	1,2,4-Trimethylbenzene	1.65E-02	1.65E-02
Aluminum	6.3E-02	Toluene	1.87E-03	1.87E-03
Arsenic	nc			
Barium	1.1E-01			
Beryllium	nc			
Cadmium	1.9E-02			
Chromium	2.4E-02			
Manganese	3.0E-01			
Nickel	6.9E-05			
Thallium	nc			
TOTAL	1.4E+00	TOTAL	7.46E-01	7.05E-01

Notes: nc-- Not a COPC for listed station

TABLE 2-21
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
CENTENNIAL DRIVE

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	1.6E-05	Arsenic	9.31E-07	9.31E-07
Chloromethane	3.8E-07	Benzene	1.71E-06	1.71E-06
Dichloromethane	2.1E-07	1,3-Butadiene	1.05E-06	1.93E-06
		Carbon Tetrachloride	8.92E-08	8.92E-08
Arsenic	nc	Nickel	6.53E-07	6.53E-07
Beryllium	nc			
Cadmium	1.9E-06			
Chromium	1.1E-05			
Nickel	1.8E-07			
TOTAL	2.9E-05	TOTAL	4.44E-06	5.32E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-22
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
CORN FIELD

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	8.5E-06	Benzene	2.3E-06	Arsenic	1.71E-06	1.71E-06
Chloromethane	4.2E-07	Carbon tetrachloride	1.8E-06	Benzene	2.60E-06	2.60E-06
Dichloromethane	1.3E-07	Chloroethane	nc	1,3-Butadiene	2.91E-06	5.35E-06
		Chloromethane	4.5E-07	Carbon Tetrachloride	4.37E-07	4.37E-07
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	1.27E-06	1.27E-06
Beryllium	nc	Dichloromethane	nc			
Cadmium	1.6E-06	Hexachlorobutadiene	nc			
Chromium	8.7E-06	Tetrachloroethene	7.4E-08			
Nickel	1.6E-07					
TOTAL	1.9E-05	TOTAL	4.6E-06	TOTAL	8.92E-06	1.14E-05

Notes: nc-- Not a COPC for listed station

TABLE 2-23
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
KENOVA FIRE STATION

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	2.2E-05	Benzene	4.7E-06	Arsenic	6.35E-07	6.35E-07
Chloromethane	4.0E-07	Carbon tetrachloride	2.5E-06	Benzene	6.15E-07	6.15E-07
Dichloromethane	3.1E-07	Chloroethane	9.7E-08	1,3-Butadiene	3.07E-07	5.63E-07
		Chloromethane	5.6E-07	Carbon Tetrachloride	2.54E-08	2.54E-08
Arsenic	4.7E-06	1,4-Dichlorobenzene	7.6E-07	Nickel	4.15E-07	4.15E-07
Beryllium	nc	Dichloromethane	5.7E-08			
Cadmium	2.5E-06	Hexachlorobutadiene	2.6E-06			
Chromium	1.5E-05	Tetrachloroethene	7.4E-08			
Nickel	2.3E-07					
TOTAL	4.5E-05	TOTAL	1.1E-05	TOTAL	2.00E-06	2.25E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-24
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
KENOVA WATER WORKS

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	3.6E-06	Benzene	1.5E-06	Arsenic	2.72E-07	2.72E-07
Chloromethane	5.6E-07	Carbon tetrachloride	nc	Benzene	4.11E-07	4.11E-07
Dichloromethane	4.6E-07	Chloroethane	nc	1,3-Butadiene	1.20E-07	2.20E-07
		Chloromethane	1.9E-07	Carbon Tetrachloride	6.88E-09	6.88E-09
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	1.88E-07	1.88E-07
Beryllium	nc	Dichloromethane	nc			
Cadmium	1.4E-06	Hexachlorobutadiene	nc			
Chromium	6.5E-06	Tetrachloroethene	nc			
Nickel	2.3E-07					
TOTAL	1.3E-05	TOTAL	1.7E-06	TOTAL	9.98E-07	1.10E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-25
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
LOCKWOOD ESTATES

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	2.1E-06	Arsenic	1.59E-07	1.59E-07
Chloromethane	5.6E-07	Benzene	1.74E-07	1.74E-07
Dichloromethane	9.5E-08	1,3-Butadiene	5.34E-08	9.82E-08
		Carbon Tetrachloride	2.99E-09	2.99E-09
Arsenic	4.9E-06	Nickel	1.07E-07	1.07E-07
Beryllium	nc			
Cadmium	1.4E-06			
Chromium	8.0E-06			
Nickel	1.6E-07			
TOTAL	1.7E-05	TOTAL	4.97E-07	5.42E-07

Notes: nc-- Not a COPC for listed station

TABLE 2-26
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR CHILD RECEPTOR, RME
SWEET RUN

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	4.5E-06	Arsenic	7.79E-07	7.79E-07
Chloromethane	6.1E-07	Benzene	1.62E-06	1.62E-06
Dichloromethane	2.7E-05	1,3-Butadiene	6.41E-07	1.18E-06
		Carbon Tetrachloride	3.81E-08	3.81E-08
Arsenic	nc	Nickel	5.65E-07	5.65E-07
Beryllium	nc			
Cadmium	1.5E-06			
Chromium	7.0E-06			
Nickel	1.4E-07			
TOTAL	4.1E-05	TOTAL	3.64E-06	4.18E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-27
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
CENTENNIAL DRIVE

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	2.3E-05	Arsenic	1.33E-06	1.33E-06
Chloromethane	5.4E-07	Benzene	2.45E-06	2.45E-06
Dichloromethane	3.0E-07	1,3-Butadiene	1.50E-06	2.76E-06
		Carbon Tetrachloride	1.27E-07	1.27E-07
Arsenic	nc	Nickel	9.33E-07	9.33E-07
Beryllium	nc			
Cadmium	2.7E-06			
Chromium	1.5E-05			
Nickel	2.6E-07			
TOTAL	4.2E-05	Total	6.34E-06	7.60E-06

Notes: nc– Not a COPC for listed station

TABLE 2-28
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
CORN FIELD

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	1.2E-05	Benzene	3.3E-06	Arsenic	2.44E-06	2.44E-06
Chloromethane	6.0E-07	Carbon tetrachloride	2.5E-06	Benzene	3.72E-06	3.72E-06
Dichloromethane	1.8E-07	Chloroethane	nc	1,3-Butadiene	4.16E-06	7.64E-06
		Chloromethane	6.4E-07	Carbon Tetrachloride	6.24E-07	6.24E-07
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	1.81E-06	1.81E-06
Beryllium	nc	Dichloromethane	nc			
Cadmium	2.4E-06	Hexachlorobutadiene	nc			
Chromium	1.2E-05	Tetrachloroethene	1.1E-07			
Nickel	2.2E-07					
TOTAL	2.8E-05	TOTAL	6.6E-06	Total	1.27E-05	1.62E-05

Notes: nc– Not a COPC for listed station

TABLE 2-29
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
KENOVA FIRE STATION

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	3.1E-05	Benzene	6.7E-06	Arsenic	9.07E-07	9.07E-07
Chloromethane	5.7E-07	Carbon tetrachloride	3.6E-06	Benzene	8.78E-07	8.78E-07
Dichloromethane	4.5E-07	Chloroethane	1.4E-07	1,3-Butadiene	4.38E-07	8.05E-07
		Chloromethane	8.0E-07	Carbon Tetrachloride	3.63E-08	3.63E-08
Arsenic	6.7E-06	1,4-Dichlorobenzene	1.1E-06	Nickel	5.93E-07	5.93E-07
Beryllium	nc	Dichloromethane	8.1E-08			
Cadmium	3.5E-06	Hexachlorobutadiene	3.7E-06			
Chromium	2.1E-05	Tetrachloroethene	1.1E-07			
Nickel	3.3E-07					
TOTAL	6.4E-05	TOTAL	1.6E-05	Total	2.85E-06	3.22E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-30
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
KENOVA WATER WORKS

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	5.1E-06	Benzene	2.1E-06	Arsenic	3.88E-07	3.88E-07
Chloromethane	8.0E-07	Carbon tetrachloride	nc	Benzene	5.88E-07	5.88E-07
Dichloromethane	6.5E-07	Chloroethane	nc	1,3-Butadiene	1.71E-07	3.15E-07
		Chloromethane	2.6E-07	Carbon Tetrachloride	9.82E-09	9.82E-09
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	2.69E-07	2.69E-07
Beryllium	nc	Dichloromethane	nc			
Cadmium	1.9E-06	Hexachlorobutadiene	nc			
Chromium	9.2E-06	Tetrachloroethene	nc			
Nickel	3.3E-07					
TOTAL	1.8E-05	TOTAL	2.4E-06	Total	1.43E-06	1.57E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-31
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
LOCKWOOD ESTATES

Air Monitoring Results		Air Modeling Results		
			Cancer Risks	
Chemical	Cancer Risks	Chemical	TASK 1	TASK 3
Benzene	3.0E-06	Arsenic	2.28E-07	2.28E-07
Chloromethane	8.1E-07	Benzene	2.49E-07	2.49E-07
Dichloromethane	1.4E-07	1,3-Butadiene	7.63E-08	1.40E-07
		Carbon Tetrachloride	4.27E-09	4.27E-09
Arsenic	7.0E-06	Nickel	1.52E-07	1.52E-07
Beryllium	nc			
Cadmium	2.0E-06			
Chromium	1.1E-05			
Nickel	2.3E-07			
TOTAL	2.5E-05	Total	7.10E-07	7.73E-07

Notes: nc-- Not a COPC for listed station

TABLE 2-32
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR ADULT RECEPTOR, RME
SWEET RUN

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	6.4E-06	Arsenic	1.11E-06	1.11E-06
Chloromethane	8.7E-07	Benzene	2.31E-06	2.31E-06
Dichloromethane	3.9E-05	1,3-Butadiene	9.15E-07	1.68E-06
		Carbon Tetrachloride	5.44E-08	5.44E-08
Arsenic	nc	Nickel	8.06E-07	8.06E-07
Beryllium	nc			
Cadmium	2.1E-06			
Chromium	1.0E-05			
Nickel	2.0E-07			
TOTAL	5.8E-05	Total	5.20E-06	5.97E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-33
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
CENTENNIAL DRIVE

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	3.9E-05	Arsenic	2.26E-06	2.26E-06
Chloromethane	9.2E-07	Benzene	4.16E-06	4.16E-06
Dichloromethane	5.0E-07	1,3-Butadiene	2.56E-06	4.70E-06
		Carbon Tetrachloride	2.17E-07	2.17E-07
Arsenic	nc	Nickel	1.59E-06	1.59E-06
Beryllium	nc			
Cadmium	4.5E-06			
Chromium	2.6E-05			
Nickel	4.4E-07			
TOTAL	7.1E-05	TOTAL	1.08E-05	1.29E-05

Notes: nc– Not a COPC for listed station

TABLE 2-34
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
CORN FIELD

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	2.1E-05	Benzene	5.7E-06	Arsenic	4.14E-06	4.14E-06
Chloromethane	1.0E-06	Carbon tetrachloride	4.3E-06	Benzene	6.32E-06	6.32E-06
Dichloromethane	3.1E-07	Chloroethane	nc	1,3-Butadiene	7.07E-06	1.30E-05
		Chloromethane	1.1E-06	Carbon Tetrachloride	1.06E-06	1.06E-06
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	3.08E-06	3.08E-06
Beryllium	nc	Dichloromethane	nc			
Cadmium	4.0E-06	Hexachlorobutadiene	nc			
Chromium	2.1E-05	Tetrachloroethene	1.8E-07			
Nickel	3.8E-07					
TOTAL	4.7E-05	TOTAL	1.1E-05	TOTAL	2.17E-05	2.76E-05

Notes: nc-- Not a COPC for listed station

TABLE 2-35
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
KENOVA FIRE STATION

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	5.3E-05	Benzene	1.1E-05	Arsenic	1.54E-06	1.54E-06
Chloromethane	9.7E-07	Carbon tetrachloride	6.0E-06	Benzene	1.49E-06	1.49E-06
Dichloromethane	7.6E-07	Chloroethane	2.3E-07	1,3-Butadiene	7.45E-07	1.37E-06
		Chloromethane	1.4E-06	Carbon Tetrachloride	6.17E-08	6.17E-08
Arsenic	1.1E-05	1,4-Dichlorobenzene	1.8E-06	Nickel	1.01E-06	1.01E-06
Beryllium	nc	Dichloromethane	1.4E-07			
Cadmium	6.0E-06	Hexachlorobutadiene	6.3E-06			
Chromium	3.6E-05	Tetrachloroethene	1.8E-07			
Nickel	5.6E-07					
TOTAL	1.1E-04	TOTAL	2.8E-05	TOTAL	4.85E-06	5.48E-06

Notes: nc– Not a COPC for listed station

TABLE 2-36
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
KENOVA WATER WORKS

MONITORING-STATIONARY		MONITORING-MOBIL		MODELING		
					Cancer Risk	
Chemical	Cancer Risk	Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	8.8E-06	Benzene	3.6E-06	Arsenic	6.60E-07	6.60E-07
Chloromethane	1.4E-06	Carbon tetrachloride	nc	Benzene	9.99E-07	9.99E-07
Dichloromethane	1.1E-06	Chloroethane	nc	1,3-Butadiene	2.92E-07	5.35E-07
		Chloromethane	4.5E-07	Carbon Tetrachloride	1.67E-08	1.67E-08
Arsenic	nc	1,4-Dichlorobenzene	nc	Nickel	4.57E-07	4.57E-07
Beryllium	nc	Dichloromethane	nc			
Cadmium	3.3E-06	Hexachlorobutadiene	nc			
Chromium	1.6E-05	Tetrachloroethene	nc			
Nickel	5.6E-07					
TOTAL	3.1E-05	TOTAL	4.1E-06	TOTAL	2.42E-06	2.67E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-37
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
LOCKWOOD ESTATES

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	5.2E-06	Arsenic	3.87E-07	3.87E-07
Chloromethane	1.4E-06	Benzene	4.23E-07	4.23E-07
Dichloromethane	2.3E-07	1,3-Butadiene	1.30E-07	2.38E-07
		Carbon Tetrachloride	7.27E-09	7.27E-09
Arsenic	1.2E-05	Nickel	2.59E-07	2.59E-07
Beryllium	nc			
Cadmium	3.4E-06			
Chromium	1.9E-05			
Nickel	3.9E-07			
TOTAL	4.2E-05	TOTAL	1.21E-06	1.32E-06

Notes: nc-- Not a COPC for listed station

TABLE 2-38
COMPARISON OF MONITORED AND MODELED CHRONIC RISK RESULTS
CANCER RISKS FOR LIFETIME RECEPTOR, RME
SWEET RUN

Air Monitoring Results		Air Modeling Results		
			Cancer Risk	
Chemical	Cancer Risk	Chemical	TASK 1	TASK 3
Benzene	1.1E-05	Arsenic	1.89E-06	1.89E-06
Chloromethane	1.5E-06	Benzene	3.93E-06	3.93E-06
Dichloromethane	6.6E-05	1,3-Butadiene	1.56E-06	2.86E-06
		Carbon Tetrachloride	9.25E-08	9.25E-08
Arsenic	nc	Nickel	1.37E-06	1.37E-06
Beryllium	nc			
Cadmium	3.6E-06			
Chromium	1.7E-05			
Nickel	3.4E-07			
TOTAL	9.9E-05	TOTAL	8.84E-06	1.01E-05

Notes: nc-- Not a COPC for listed station

Table 3-1
Acute Screening Values for Comparison with 24 Hour Samples and Modeled Data

Contaminant	Source of Screening Value	Original Screening Value not adjusted for time-- ug/m3	Time Period of Original Screening Value (hours)	n of chemical	Final screening value for 24 hour comparison-- ug/m3	Source of n Value
Acenapthene	No Source	NA	NA	NA	None	
Acenapthylene	No Source	NA	NA	NA	None	
Acrylic Acid	CAL REL	6.0E+03	1	1	2.50E+02	CAL REL
Aluminum	No Source	NA	NA	NA	None	
Ammonia	ATSDR MRLs	3.5E+02	24	NA	3.5E+02	
Anthracene	No Source	NA	NA	NA	None	
Antimony	No Source	NA	NA	NA	None	
Arsenic	CAL REL	1.9E-01	4	1	3.2E-02	CAL REL
Barium	No Source	NA	NA	NA	None	
Benzene	ATSDR MRLs	1.6E+02	24	NA	1.6E+02	
Benzo(a)anthracene	No Source	NA	NA	NA	None	
Benzo(a)pyrene	No Source	NA	NA	NA	None	
Benzo(b)fluoranthene	No Source	NA	NA	NA	None	
Beryllium	AIHA ERPG	2.5E+01	1	1	1.0E+00	Default
Biphenyl	No Source	NA	NA	NA	None	
Bromoform	No Source	NA	NA	NA	None	
Bromomethane	ATSDR MRLs	1.9E+02	24	NA	1.9E+02	
1,3-Butadiene	AIHA ERPG	2.2E+04	1	1	9.2E+02	Default
Cadmium	No Source	NA	NA	NA	None	
Calcium oxides	No Source	NA	NA	NA	None	
Carbon Disulfide	CAL REL	6.2E+03	6	1	1.6E+03	CAL REL
Carbon Tetrachloride	ATSDR MRLs	1.3E+03	24	NA	1.3E+03	
Chlorine	CAL REL	2.1E+02	1	2.8	6.75E+01	CAL REL
Chlorobenzene	No Source	NA	NA	NA	None	
Chloroethane	ATSDR MRLs	4.0E+04	24	NA	4.0E+04	
Chloromethane	ATSDR MRLs	1.0E+03	24	NA	1.0E+03	
Chromium (VI)	No Source	NA	NA	NA	None	
Chrysene	No Source	NA	NA	NA	None	
Cobalt	No Source	NA	NA	NA	None	
Copper	CAL REL	1.0E+02	1	1	4.17E+00	CAL REL
Cumene	No Source	NA	NA	NA	None	
Cyclohexane	No Source	NA	NA	NA	None	
Cymene	No Source	NA	NA	NA	None	
Dibenz(a,h,)anthracene	No Source	NA	NA	NA	None	
1,4-dichlorobenzene	ATSDR MRLs	4.8E+03	24	NA	4.8E+03	
Dichlorodifluoromethane	No Source	NA	NA	NA	None	
Dichloromethane	ATSDR MRLs	1.0E+04	24	NA	1.0E+04	
2,2-dichloropropane	No Source	NA	NA	NA	None	
2,3-Dimethylpentane	No Source	NA	NA	NA	None	
Ethyl benzene	No Source	NA	NA	NA	None	
Fluoranthene	No Source	NA	NA	NA	None	
Fluorine	No Source	NA	NA	NA	None	
Furfural	No Source	NA	NA	NA	None	
1,3-hexandien-5-yne	No Source	NA	NA	NA	None	
n-Hexane	No Source	NA	NA	NA	None	
Hydrogen chloride	CAL REL	2.1E+03	1	1.5	2.52E+02	CAL REL
Hydrogen fluoride	CAL REL	2.4E+02	1	2	4.90E+01	CAL REL
Hydronium ion	No Source	NA	NA	NA	None	
Indeno(1,2,3-cd)pyrene	No Source	NA	NA	NA	None	
Lead	No Source	NA	NA	NA	None	
Maleic Anhydride	No Source	NA	NA	NA	None	
Manganese	No Source	NA	NA	NA	None	
Mercury	CAL REL	1.8E+00	1	1	7.5E-02	CAL REL
Methanol	CAL REL	2.8E+04	1	1	1.2E+03	CAL REL
1-Methylcyclopentane	No Source	NA	NA	NA	None	
Methylene Chloride	ATSDR MRLs	1.0E+04	24	NA	1.0E+04	

Table 3-1
Acute Screening Values for Comparison with 24 Hour Samples and Modeled Data

Contaminant	Source of Screening Value	Original Screening Value not adjusted for time-- ug/m3	Time Period of Original Screening Value (hours)	n of chemical	Final screening value for 24 hour comparison-- ug/m3	Source of n Value
4-Methyl-2-pentene	No Source	NA	NA	NA	None	
Methyl Tertiary Butyl Ether (MTBE)	ATSDR MRLs	7.2E+03	24	NA	7.2E+03	
Molybdenum	No Source	NA	NA	NA	None	
Napthalene	No Source	NA	NA	NA	None	
Nickel	CAL REL	6.0E+00	1	1	2.50E-01	CAL REL
Nitrate	No Source	NA	NA	NA	None	
Nitric Acid	CAL REL	8.6E+01	1	3.5	3.47E+01	CAL REL
Nitrous Acid	No Source	NA	NA	NA	None	
Nonane	No Source	NA	NA	NA	None	
Phenanthrene	No Source	NA	NA	NA	None	
Propylene	No Source	NA	NA	NA	None	
Pyrene	No Source	NA	NA	NA	None	
Selenium	No Source	NA	NA	NA	None	
Silver	No Source	NA	NA	NA	None	
Styrene	CAL REL	2.1E+04	1	1	8.75E+02	CAL REL
Sulfates	CAL REL	1.2E+02	1	1	5.00E+00	CAL REL
Sulfur Dioxide	ATSDR MRLs	2.6E+01	24	NA	2.6E+01	
Tetrachloroethene	ATSDR MRLs	1.4E+03	24	NA	1.4E+03	
2,2,4,4-tetramethylpentane	No Source	NA	NA	NA	None	
Thallium	No Source	NA	NA	NA	None	
Tin	No Source	NA	NA	NA	None	
Titanium dioxide	No Source	NA	NA	NA	None	
Toluene	ATSDR MRLs	1.5E+04	24	NA	1.5E+04	
1,2,3-trichlorobenzene	No Source	NA	NA	NA	None	
1,2,4-trichlorobenzene	No Source	NA	NA	NA	None	
1,1,1-trichloroethane	ATSDR MRLs	1.1E+04	24	NA	1.1E+04	
Trichlorofluoromethane	No Source	NA	NA	NA	None	
1,2,4-trimethylbenzene	No Source	NA	NA	NA	None	
1,2,5-trimethylbenzene	No Source	NA	NA	NA	None	
2,3,4-trimethylpentane	No Source	NA	NA	NA	None	
Xylenes (mixed)	ATSDR MRLs	4.3E+03	24	NA	4.3E+03	

Notes:

Haber's Law conversion: Shorter period to longer period

$$\text{Concentration-final} = ((\text{Concentration-initial})^{n} * \text{Time-initial}/\text{Time-final})^{1/n}$$

n values: Sources of n values are presented. Where sources were not available, guidance in CAL REL publication was used to determine default values.

Table 3-2
Acute Screening Values for Comparison with 1 Hour Samples and Modeled Data

Contaminant	Source of Screening Value	Original Screening Value not adjusted for time-- ug/m3	Time Period of Original Screening Value (hours)	n of chemical	Final screening value for 1 hour comparison-- ug/m3	Source of n Value
Acenaphthene	DOE TEEL	1.3E+03	0.25	1	3.1E+02	Default
Acenapthylene	DOE TEEL	2.0E+02	0.25	1	5.0E+01	Default
Acrylic Acid	CAL REL	6.0E+03	1	1	6.00E+03	CAL REL
Aluminum	DOE TEEL	3.0E+04	0.25	1	7.5E+03	Default
Ammonia	CAL REL	3.2E+03	1	1	3.20E+03	CAL REL
Anthracene	DOE TEEL	6.0E+03	0.25	1	1.5E+03	Default
Antimony	DOE TEEL	1.5E+03	0.25	1	3.8E+02	Default
Arsenic	CAL REL	1.9E-01	4	NA	1.90E-01	CAL REL
Barium	DOE TEEL	1.5E+03	0.25	1	3.8E+02	Default
Benzene	CAL REL	1.3E+03	6	2	1.30E+03	CAL REL
Benzo(a)anthracene	DOE TEEL	6.0E+02	0.25	1	1.5E+02	Default
Benzo(a)pyrene	DOE TEEL	6.0E+02	0.25	1	1.5E+02	Default
Benzo(b)fluoranthene	No Source	NA	NA	NA	None	
Beryllium	AIHA ERPG	2.5E+01	1	NA	2.50E+01	
Biphenyl	No Source	NA	NA	NA	None	
Bromoform	DOE TEEL	6.2E+03	0.25	1	1.6E+03	Default
Bromomethane	DOE TEEL	1.2E+04	0.25	1	2.9E+03	Default
1,3-Butadiene	AIHA ERPG	2.2E+04	1	NA	2.21E+04	
Cadmium	DOE TEEL	3.0E+01	0.25	1	7.5E+00	Default
Calcium oxides	DOE TEEL	5.0E+03	0.25	1	1.3E+03	Default
Carbon Disulfide	CAL REL	6.2E+03	6	NA	6.20E+03	CAL REL
Carbon Tetrachloride	CAL REL	1.9E+03	7	2.8	1.90E+03	CAL REL
Chlorine (C12)	CAL REL	2.1E+02	1	2.8	2.10E+02	CAL REL
Chlorobenzene	DOE TEEL	5.2E+03	0.25	1	1.3E+03	Default
Chloroethane	DOE TEEL	2.6E+06	0.25	1	6.6E+05	Default
Chloromethane	No Source	NA	NA	NA	None	
Chromium (VI)	DOE TEEL	1.5E+03	0.25	1	3.8E+02	Default
Chrysene	DOE TEEL	6.0E+02	0.25	1	1.5E+02	Default
Cobalt	DOE TEEL	1.0E+02	0.25	1	2.5E+01	Default
Copper	CAL REL	1.0E+02	1	NA	1.00E+02	CAL REL
Cumene	DOE TEEL	2.5E+05	0.25	1	6.1E+04	Default
Cyclohexane	DOE TEEL	3.1E+06	0.25	1	7.7E+05	Default
Cymene	No Source	NA	NA	NA	None	
Dibenz(a,h,)anthracene	DOE TEEL	3.0E+04	0.25	1	7.5E+03	Default
1,4-dichlorobenzene	DOE TEEL	6.6E+05	0.25	1	1.7E+05	Default
Dichlorodifluoromethane	DOE TEEL	1.5E+07	0.25	1	3.7E+06	Default
Dichloromethane	CAL REL	1.4E+04	1	NA	1.40E+04	CAL REL
2,2-dichloropropane	DOE TEEL	5.1E+05	0.25	1	1.3E+05	Default
2,3-Dimethylpentane	No Source	NA	NA	NA	None	
Ethyl benzene	DOE TEEL	5.4E+05	0.25	1	1.4E+05	Default
Fluoranthene	DOE TEEL	3.0E+01	0.25	1	7.5E+00	Default
Fluorine	DOE TEEL	7.8E+02	0.25	1.9	3.74E+02	Default
Furfural	DOE TEEL	7.9E+03	0.25	1	2.0E+03	Default
1,3-hexandien-5-yne	No Source	NA	NA	NA	None	
n-Hexane	DOE TEEL	5.3E+05	0.25	1	1.3E+05	Default
Hydrogen chloride	CAL REL	2.1E+03	1	1.5	2.10E+03	CAL REL
Hydrogen fluoride	CAL REL	2.4E+02	1	2	2.40E+02	CAL REL
Hydronium ion	No Source	NA	NA	NA	None	
Indeno(1,2,3-cd)pyrene	No Source	NA	NA	NA	None	
Lead	DOE TEEL	1.5E+02	0.25	1	3.8E+01	Default
Maleic Anhydride	DOE TEEL	3.0E+03	0.25	1	7.5E+02	Default
Manganese	DOE TEEL	3.0E+03	0.25	1	7.5E+02	Default

Table 3-2
Acute Screening Values for Comparison with 1 Hour Samples and Modeled Data

Contaminant	Source of Screening Value	Original Screening Value not adjusted for time-- ug/m3	Time Period of Original Screening Value (hours)	n of chemical	Final screening value for 1 hour comparison-- ug/m3	Source of n Value
Mercury	CAL REL	1.8E+00	1	1	1.8E+00	CAL REL
Methanol	AIHA ERPG	2.6E+05	1	NA	2.62E+05	
1-Methylcyclopentane	No Source	NA	NA	NA	None	
Methylene Chloride	CAL REL	1.0E+04	1	NA	1.04E+04	CAL REL
4-Methyl-2-pentene	No Source	NA		NA	None	
Methyl Tertiary Butyl Ether (MBTE)	DOE TEEL	4.3E+05	0.25	2	2.16E+05	Default
Molybdenum	DOE TEEL	1.5E+04	0.25	1	3.8E+03	Default
Napthalene	DOE TEEL	7.9E+04	0.25	1	2.0E+04	Default
Nickel	CAL REL	6.0E+00	1	NA	6.00E+00	CAL REL
Nitrate	DOE TEEL	3.0E+04	0.25	1	7.5E+03	Default
Nitric Acid	CAL REL	8.6E+01	1	3.5	8.60E+01	CAL REL
Nitrous Acid	No Source	NA	NA	NA	None	
Nonane	DOE TEEL	1.0E+06	0.25	1	2.6E+05	Default
Phenanthrene	DOE TEEL	2.0E+03	0.25	1	5.0E+02	Default
Propylene	No Source	NA	NA	NA	None	
Pyrene	DOE TEEL	1.5E+04	0.25	1	3.8E+03	Default
Selenium	DOE TEEL	6.0E+02	0.25	1	1.5E+02	Default
Silver	DOE TEEL	3.0E+02	0.25	1	7.5E+01	Default
Styrene	CAL REL	2.1E+04	1	NA	2.10E+04	CAL REL
Sulfates	CAL REL	1.2E+02	1	NA	1.20E+02	CAL REL
Sulfur Dioxide	CAL REL	6.6E+02	1	1	6.60E+02	CAL REL
Tetrachloroethene	CAL REL	2.0E+04	1	2	2.00E+04	CAL REL
2,2,4,4-tetramethylpentane	No Source	NA	NA	NA	None	
Thallium	DOE TEEL	3.0E+02	0.25	1	7.5E+01	Default
Tin	DOE TEEL	6.0E+03	0.25	1	1.5E+03	Default
Titanium dioxide	No Source	NA	NA	NA	None	
Toluene	CAL REL	3.7E+04	1	2.5	3.70E+04	CAL REL
1,2,3-trichlorobenzene	DOE TEEL	5.0E+04	0.25	1	1.3E+04	Default
1,2,4-trichlorobenzene	DOE TEEL	3.7E+04	0.25	1	9.3E+03	Default
1,1,1-trichloroethane	DOE TEEL	1.9E+06	0.25	1	4.8E+05	Default
Trichlorofluoromethane	DOE TEEL	2.8E+06	0.25	1	7.0E+05	Default
1,2,4-trimethylbenzene	DOE TEEL	1.8E+05	0.25	1	4.5E+04	Default
1,2,5-trimethylbenzene	No Source	NA	NA	NA	None	
2,3,4-trimethylpentane	No Source	NA	NA	NA	None	
Xylenes (mixed)	CAL REL	2.2E+04	1	NA	2.20E+04	CAL REL

Notes:

Haber's Law conversion: Shorter period to longer period

$$\text{Concentration-final} = ((\text{Concentration-initial})^{n} * \text{Time-initial}/\text{Time-final})^{1/n}$$

n values: Sources of n values are presented. Where sources were not available, guidance in CAL REL publication was used to determine default values.

TABLE 3-3
ACUTE RISK ASSESSMENT
COMPARISON OF THE
HAZARD QUOTIENTS FOR
MONITORED VERSUS MODELED LOCATIONS

Monitoring Location (1)	Contaminant	Hazard Quotient	Modeling Location	Contaminant	Hazard Quotient 24- hour Modeled Data	Hazard Quotient 1-Hour Modeled Data
Centennial Drive	Sulfur Dioxide	1.12	Centennial Drive	No Exceedances	<1	<1
	Sulfate	1.82				
Corn Field	Sulfur Dioxide	1.40	Corn Field Task 2, Episode 10	Nickel	1.51	<1
	Sulfate	3.48				
Kenova Fire Station	Sulfate	2.38	Kenova Fire Station	No Exceedances	<1	<1
Kenova Water Works	Sulfate	1.91	Kenova Water Works	No Exceedances	<1	<1
Lockwood Estates	Sulfate	3.24	Lockwood Estates	No Exceedances	<1	<1
Sweet Run	Sulfate	3.22	Sweet Run	No Exceedances	<1	<1
Webbville, Kentucky	Sulfate	1.96	Webbville, Kentucky	No Exceedances	<1	<1

(1) Only air concentrations from stationary samples exceeded acute screening values.

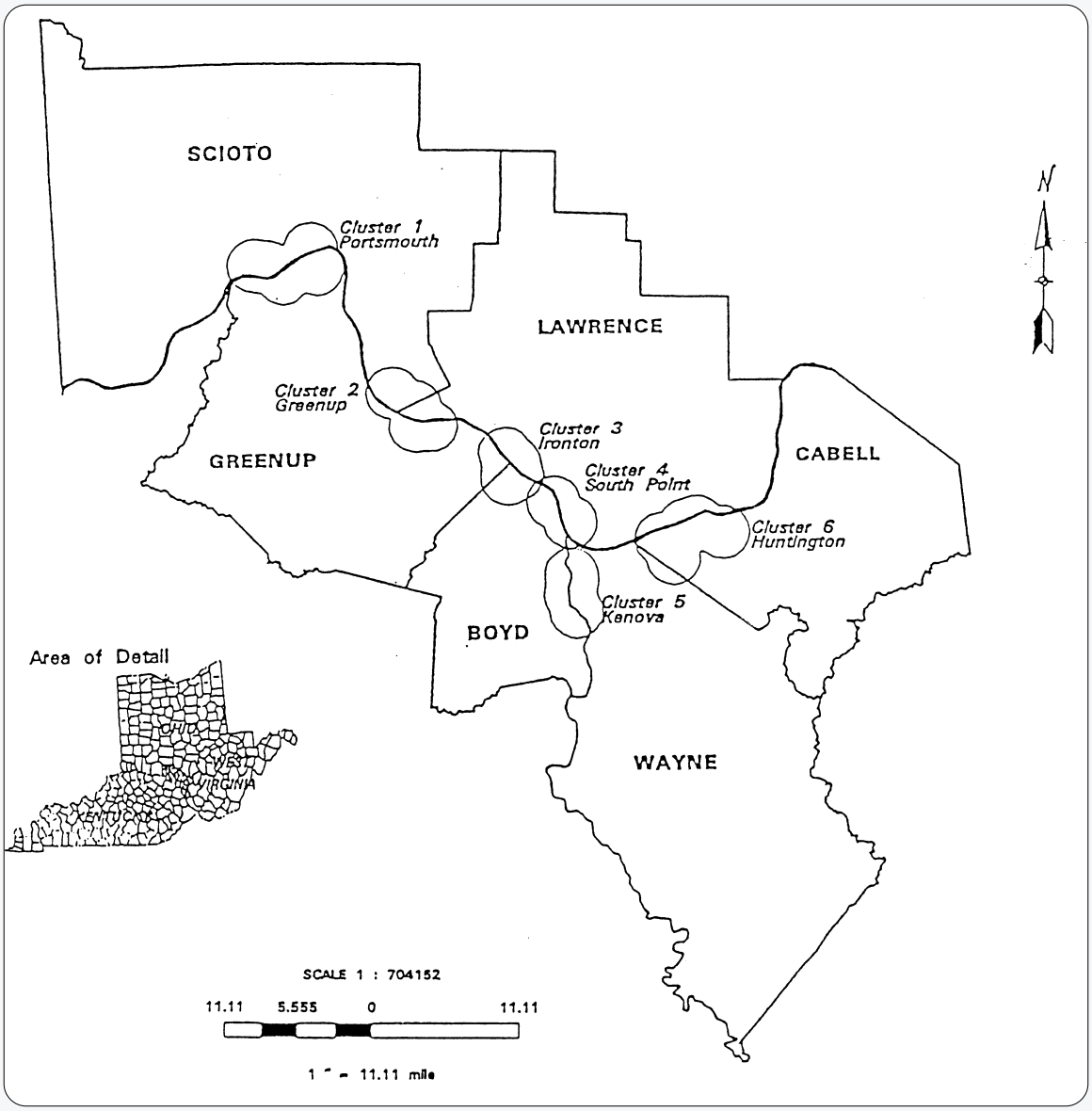


FIGURE 1-1
TRI-STATE STUDY AREA
Tri-State Geographic Initiative

Scale 1" = 11.11 mi.

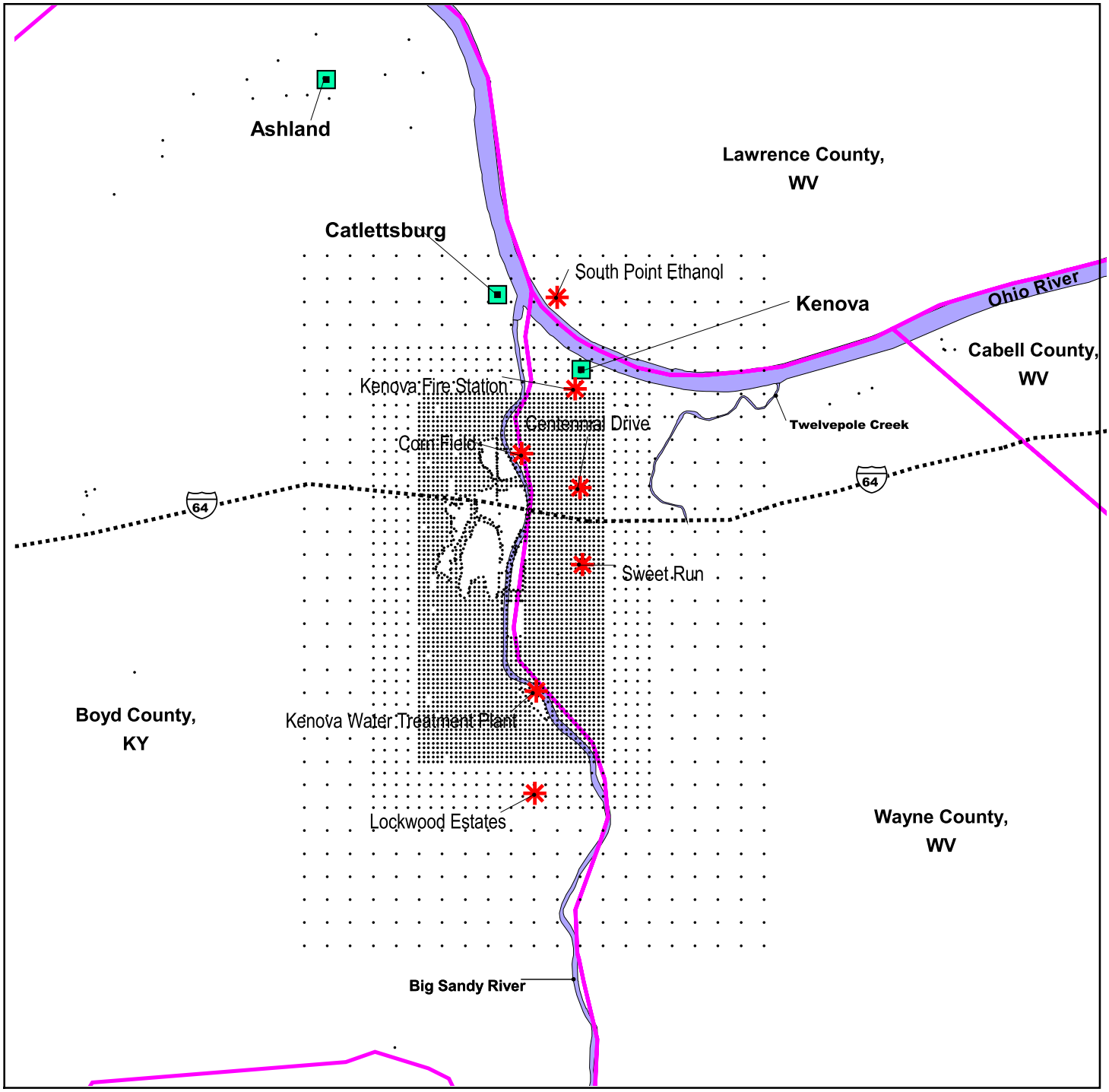
Source: Tri-State Geographic Initiative — Air Toxics Monitoring Plan (TGI 1996)

Red dots represent Tri-State Initiative air monitoring locations.
Blue rectangles represent industries.

FIGURE 1-2
STUDY AREA AND BACKGROUND MONITORING LOCATION

Tri-State Geographic Initiative
Not to Scale

Source: USEPA Website (http://www.epa.gov/ARD-R5/tristate/monitor.htm)



Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

South Point Ethanol (Mobile lab only, not a special receptor)

Political Boundaries

Highways

N

W E

S

Figure 1-3

Stationary Air Monitoring Locations, Mobile Lab Air Monitoring Locations and Modeling Grid

Scale = 1:125,000

4 0 4 Miles

Receptor - Figure 1-3
Prepared by: Gannett Fleming, Inc.

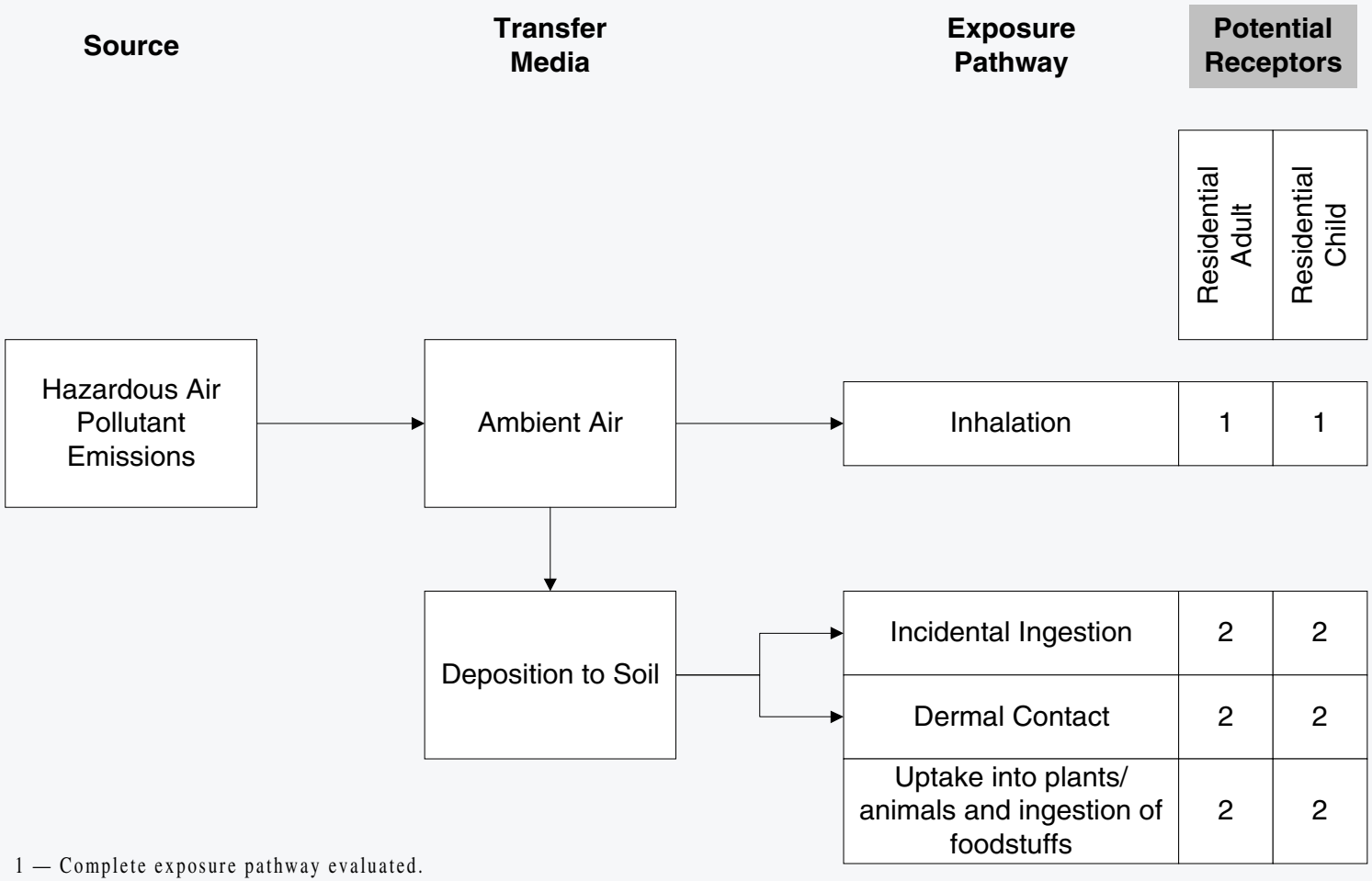
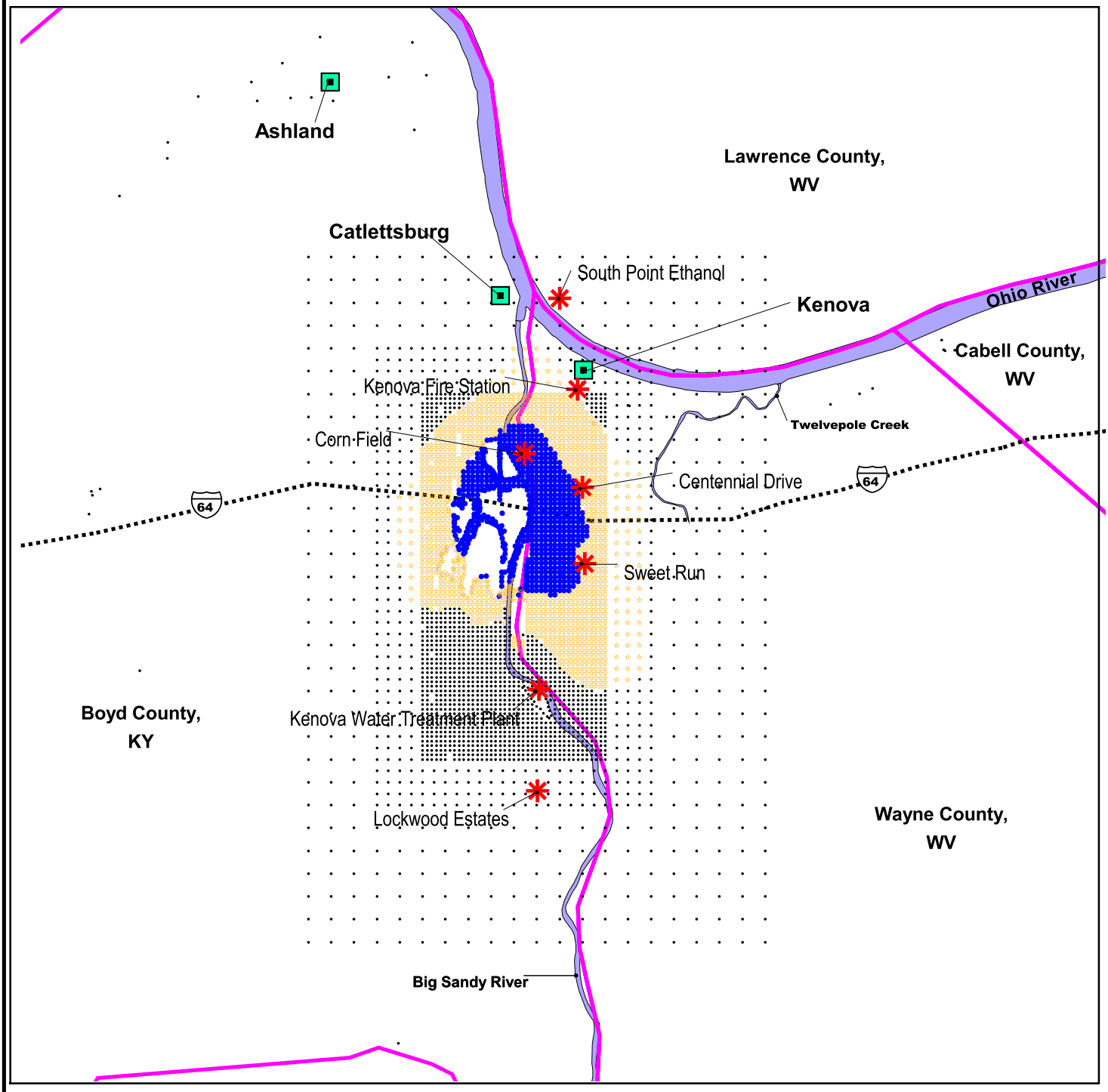


FIGURE 2-1

Human Health Conceptual Site Model



- Risks are greater or equal to 3
- Risks are less than 3, but are greater or equal to 1
- Risks are less than 1

Political Boundaries
Highways

N
W E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

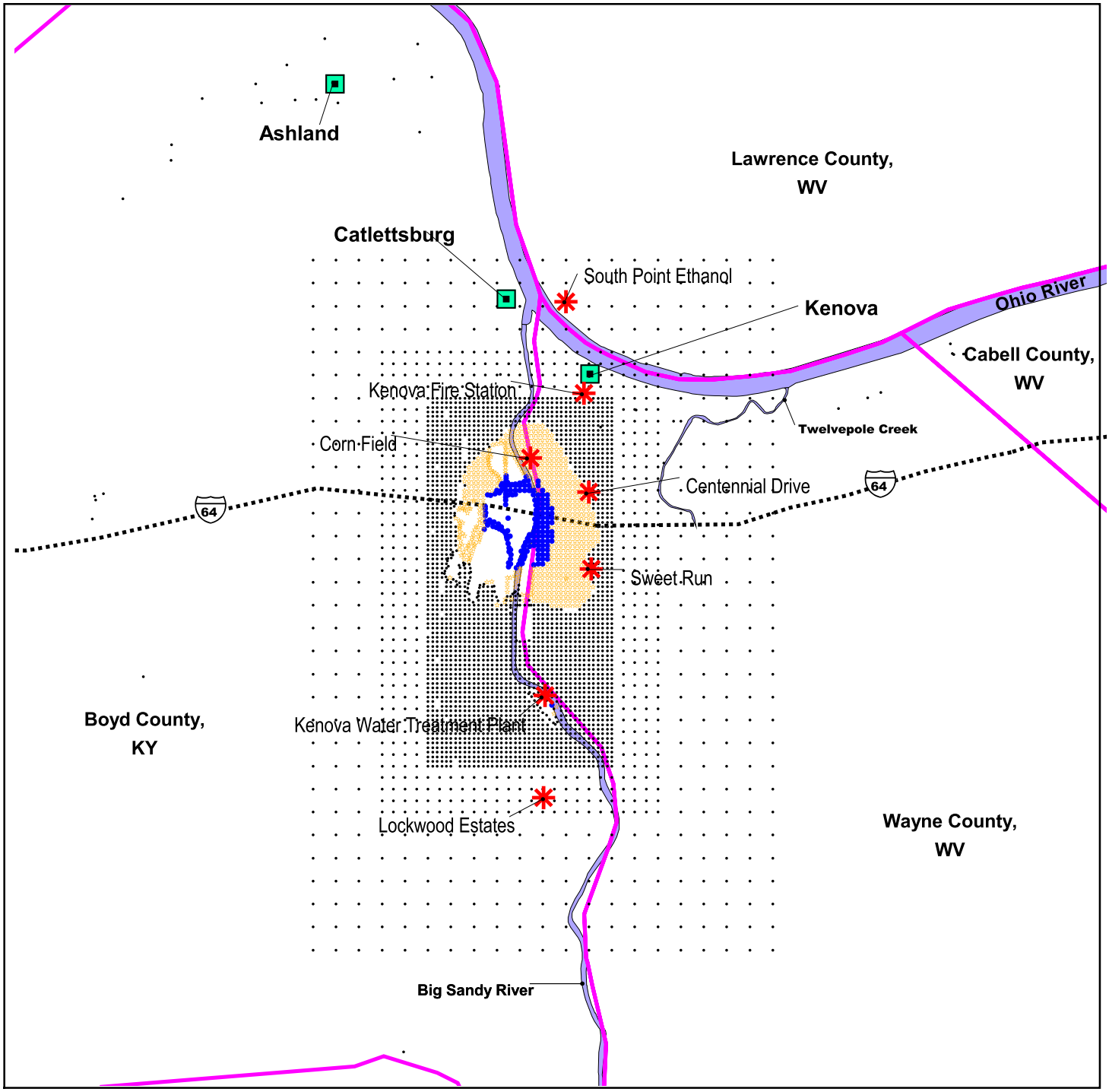
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-2
Chronic Non-Cancer Hazards for the Child Resident Receptor
Task 1 Data, RME

Receptor - Figure 2-2
Prepared by: Gannett Fleming, Inc.



- Risks are greater or equal to 3
- Risks are less than 3, but are greater or equal to 1
- Risks are less than 1

Political Boundaries

Highways

N
W E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

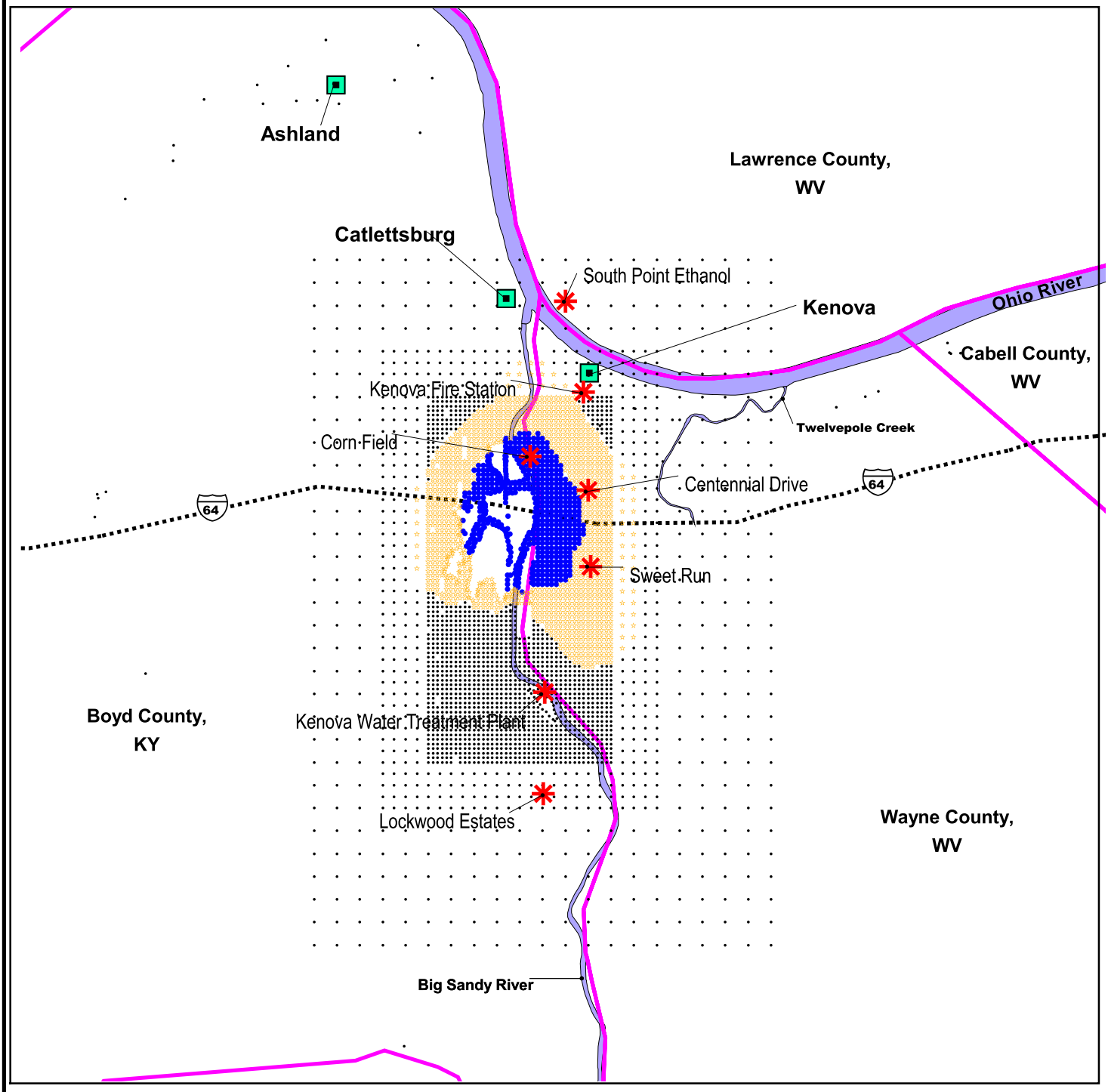
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-3
Chronic Non-Cancer Hazards for the Adult Resident Receptor
Task 1 Data, RME

Receptor - Figure 2-3
Prepared by: Gannett Fleming, Inc.



- Risks are greater or equal to 3
- Risks are less than 3, but are greater or equal to 1
- Risks are less than 1

Political Boundaries

Highways

N
W E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

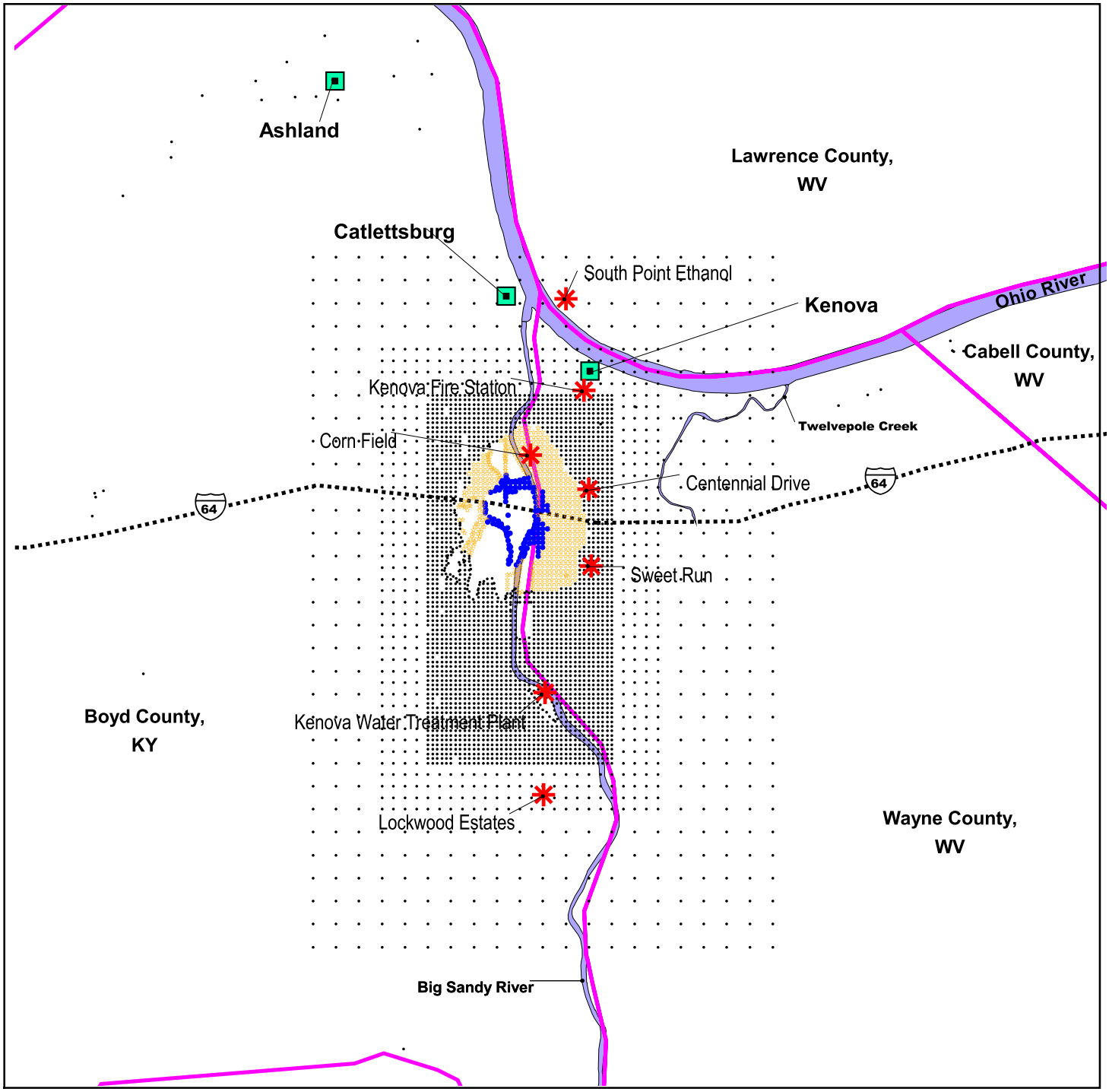
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-4
Chronic Non-Cancer Hazards for the Child Resident Receptor
Task 3 Data, RME

Receptor - Figure 2-4
Prepared by: Gannett Fleming, Inc.



- Risks are greater or equal to 3
- Risks are less than 3, but are greater or equal to 1
- Risks are less than 1

Political Boundaries

Highways

N

W E

S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

South Point Ethanol (Mobile lab only, not a special receptor)

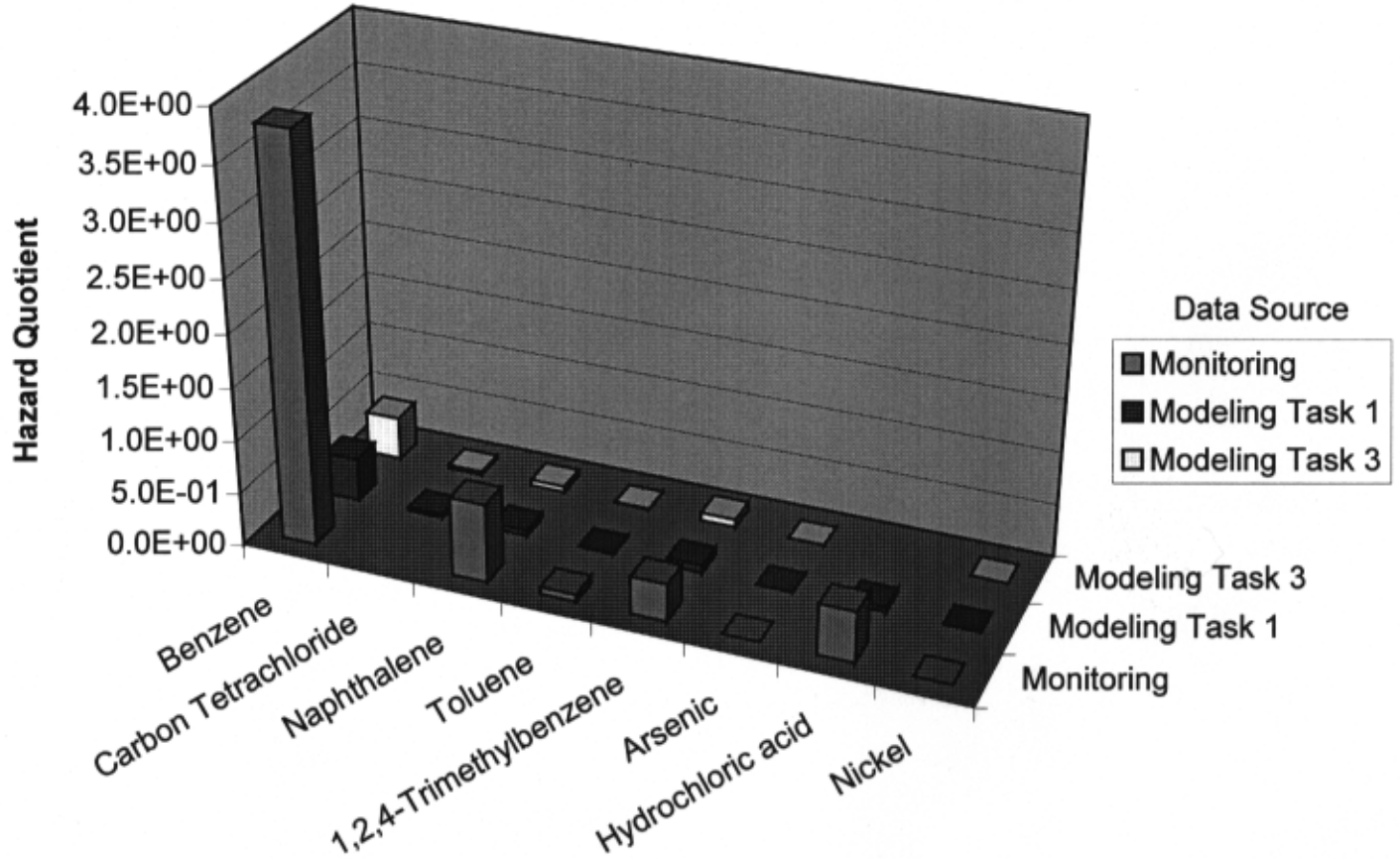
Scale = 1:125,000

4 0 4 Miles

Figure 2-5
Chronic Non-Cancer Hazards for the Adult Resident Receptor
Task 3 Data, RME

Receptor - Figure 2-5
Prepared by: Gannett Fleming, Inc.

Figure 2-6. Centennial Drive, Chronic Noncancer Risks for Child Receptor



GraphdataChildNoncancer.xls, CD,10/18/00

Figure 2-7. Corn Field, Chronic Noncancer Risks for Child Receptor

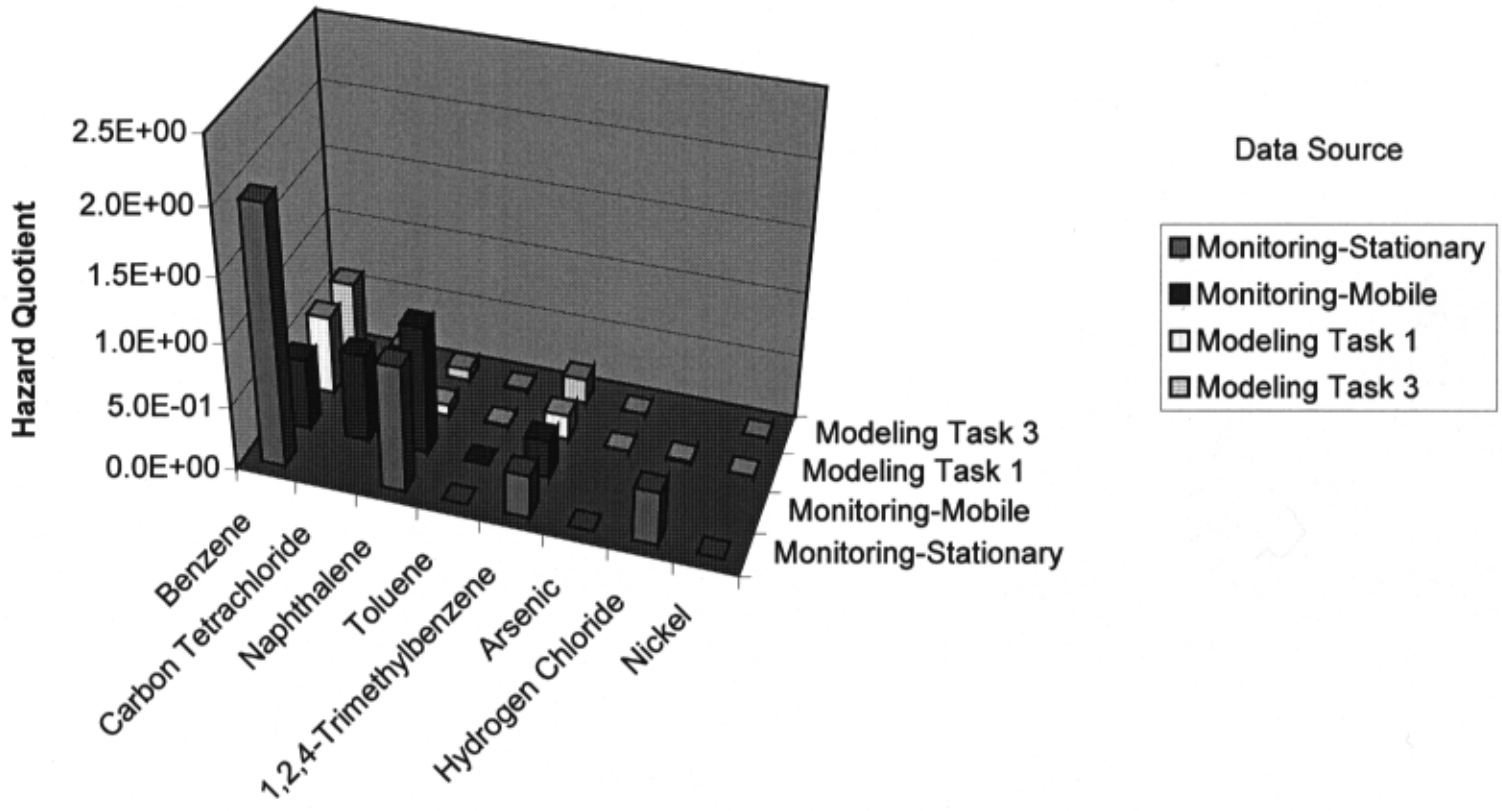


Figure 2-8. Kenova Fire Station, Chronic Noncancer Risks for Child Receptor

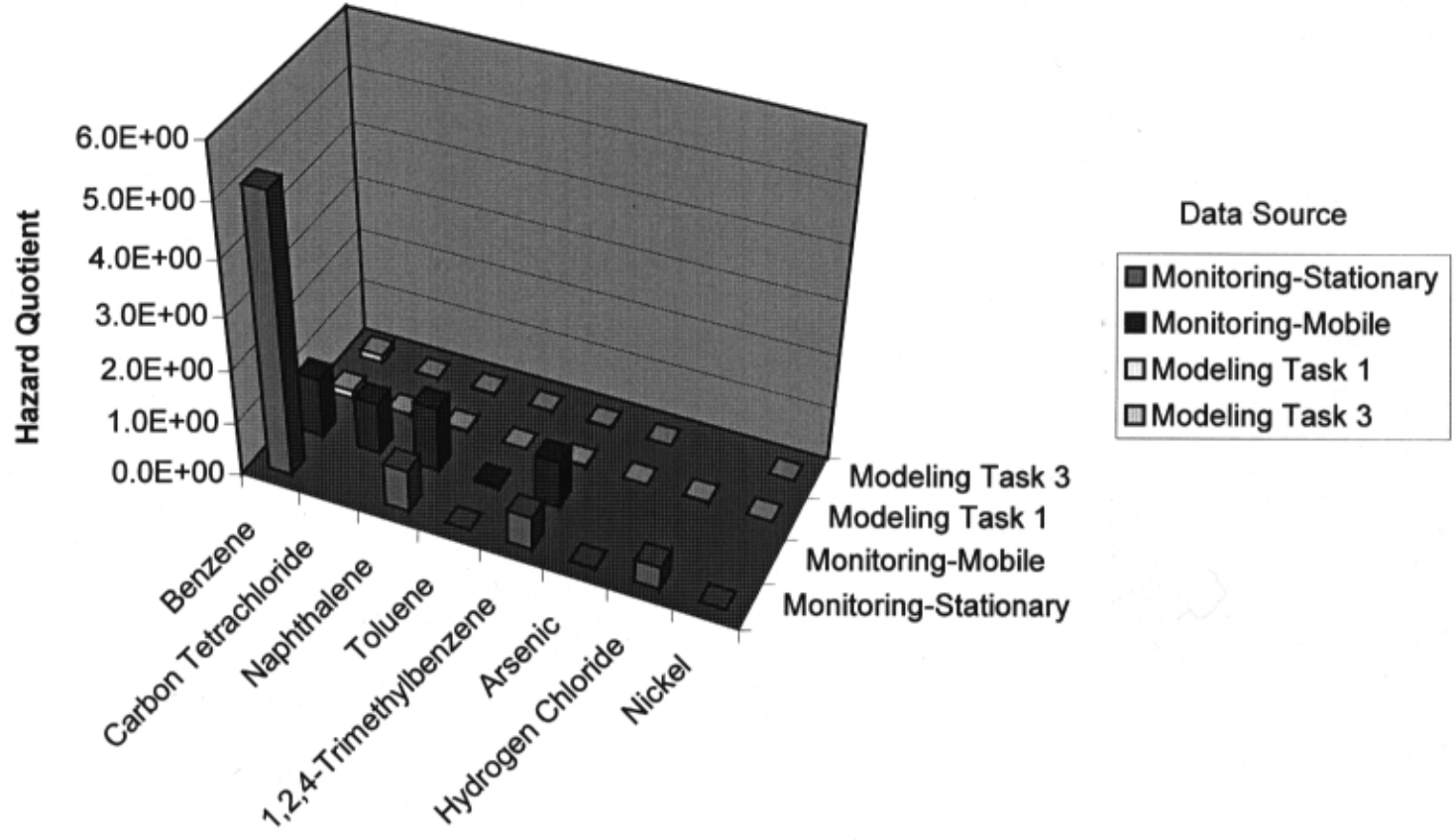


Figure 2-9. Kenova Water Works, Chronic Noncancer Risks for Child Receptor

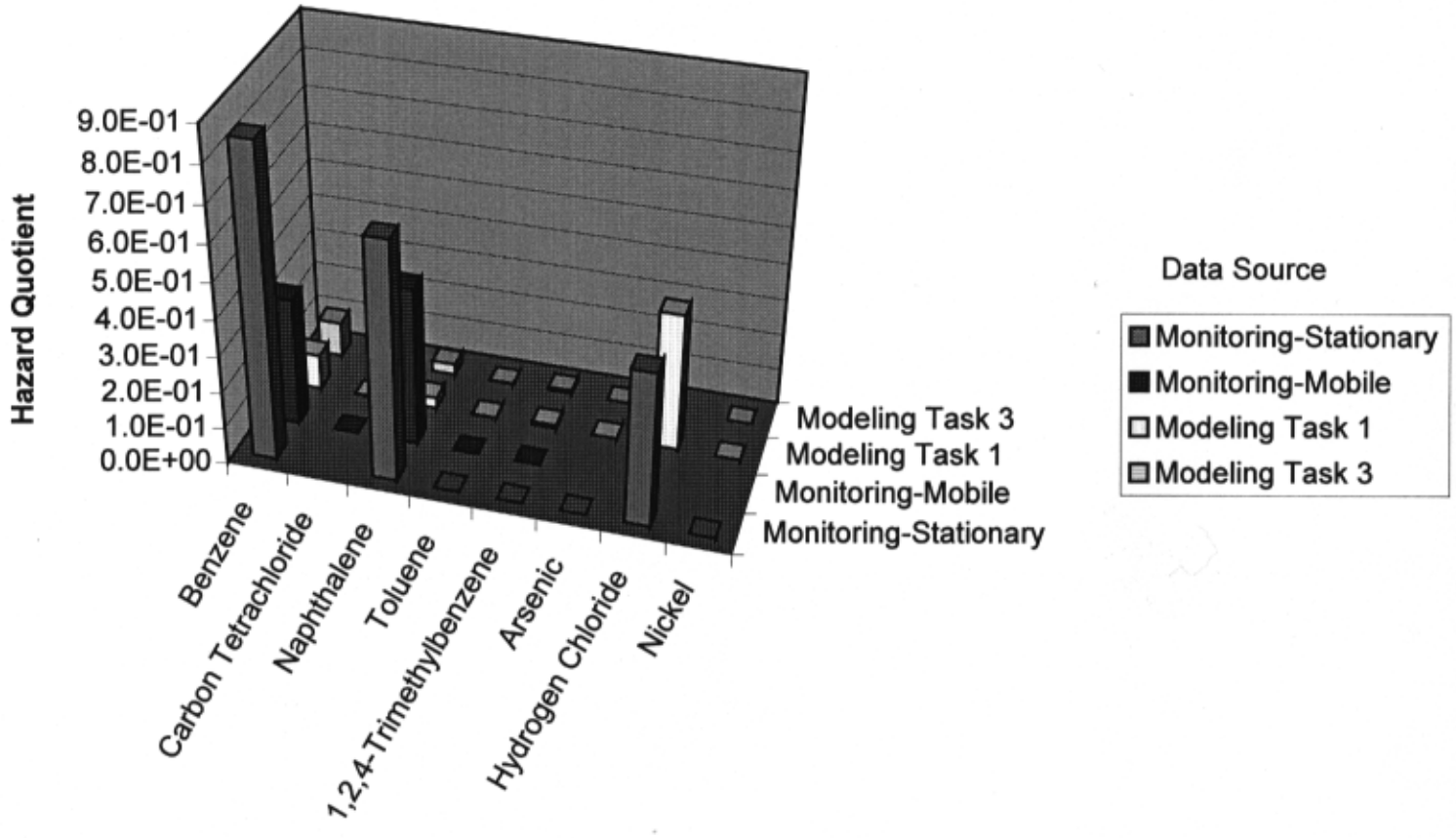


Figure 2-10. Lockwood Estates, Chronic Noncancer Risks for Child Receptor

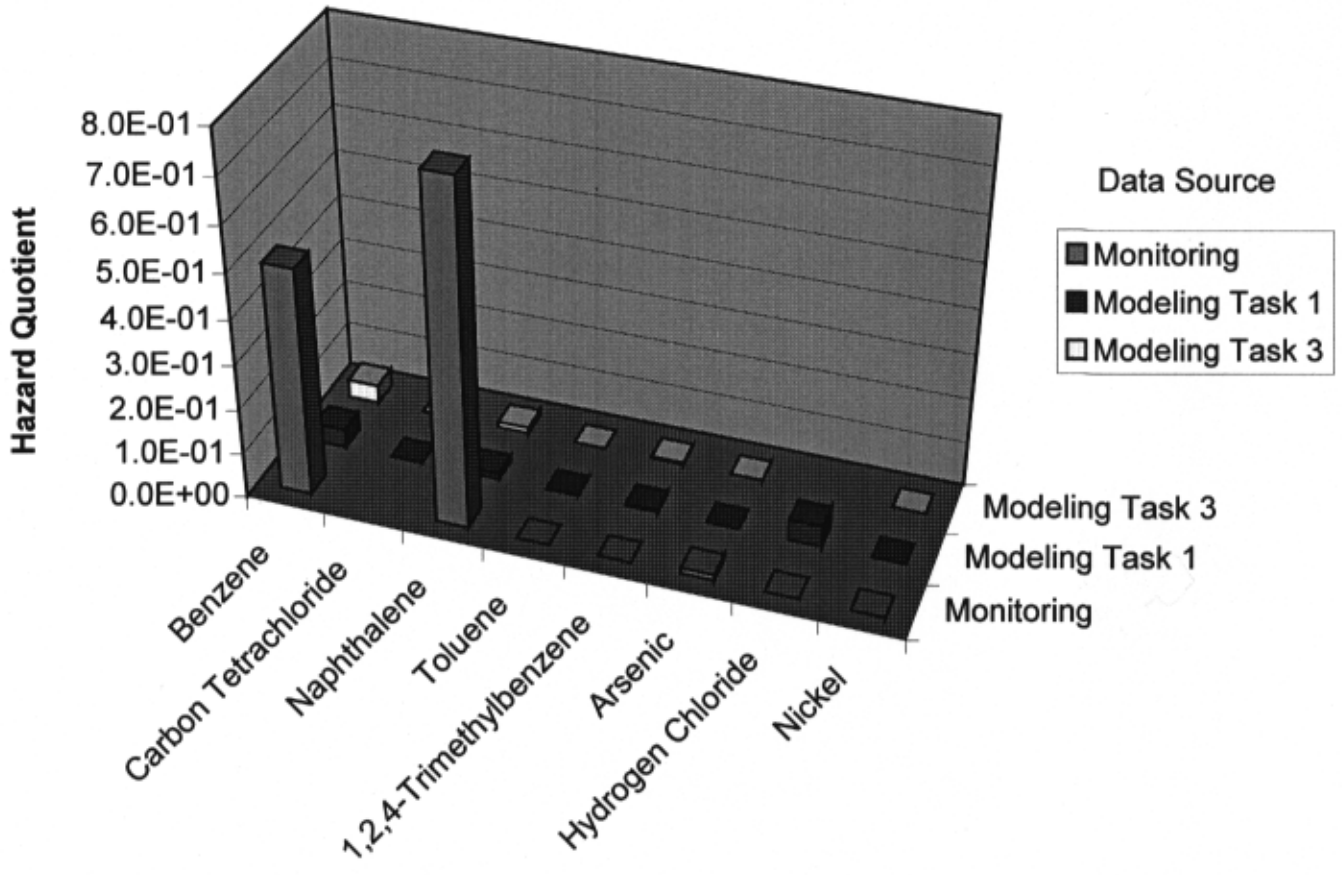
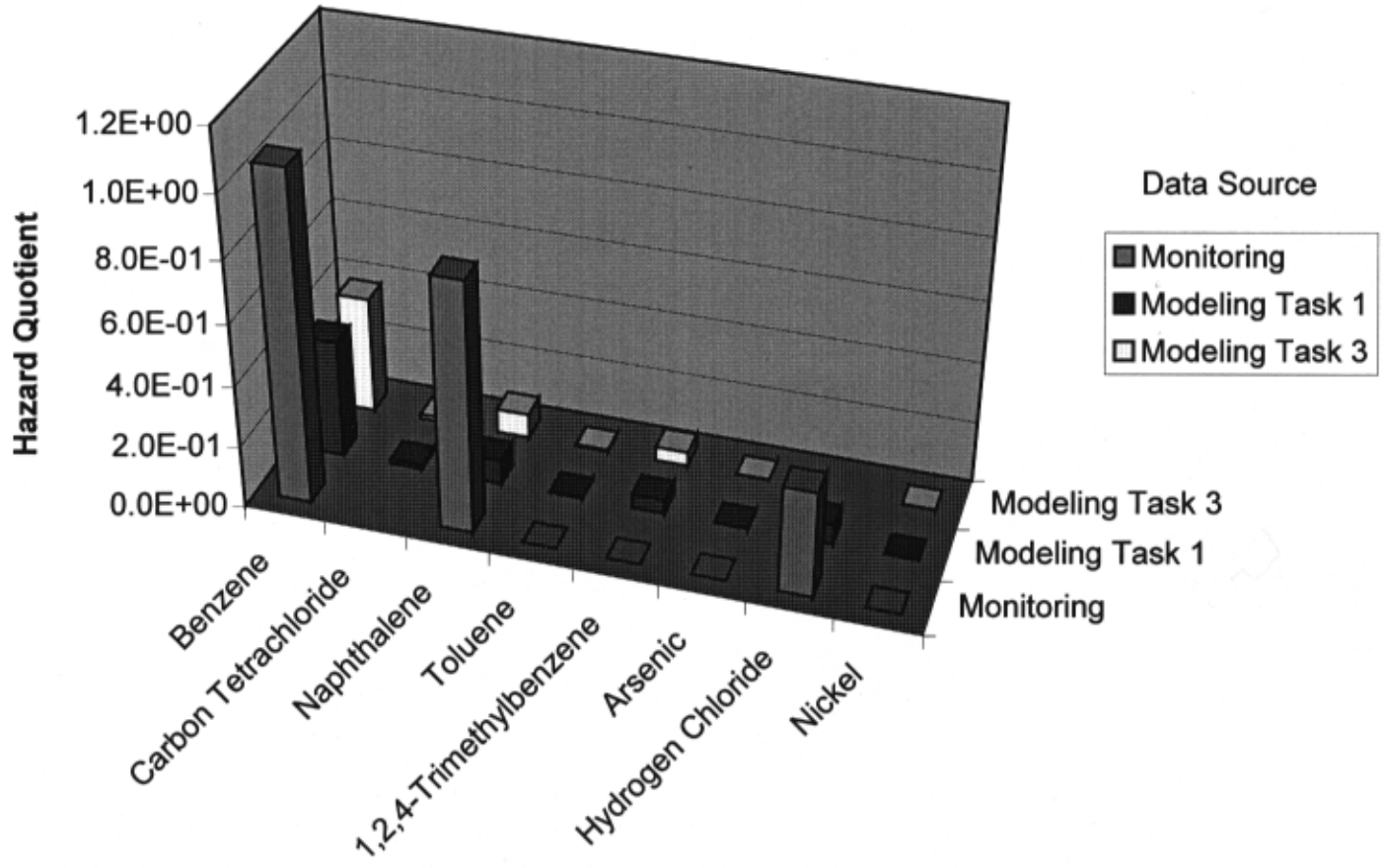
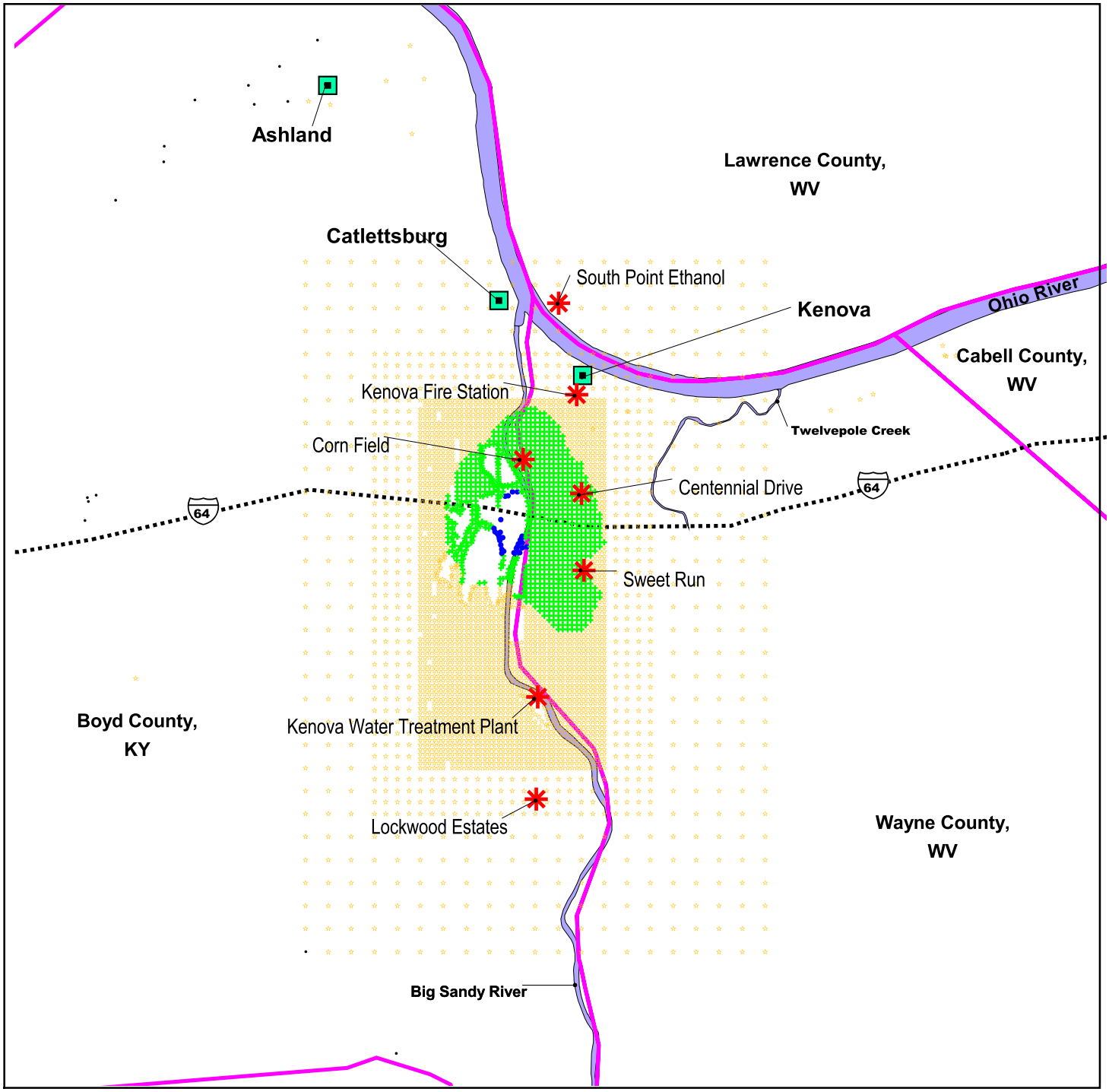


Figure 2-11. Sweet Run, Chronic Noncancer Risks for Child Receptor





- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W E
S

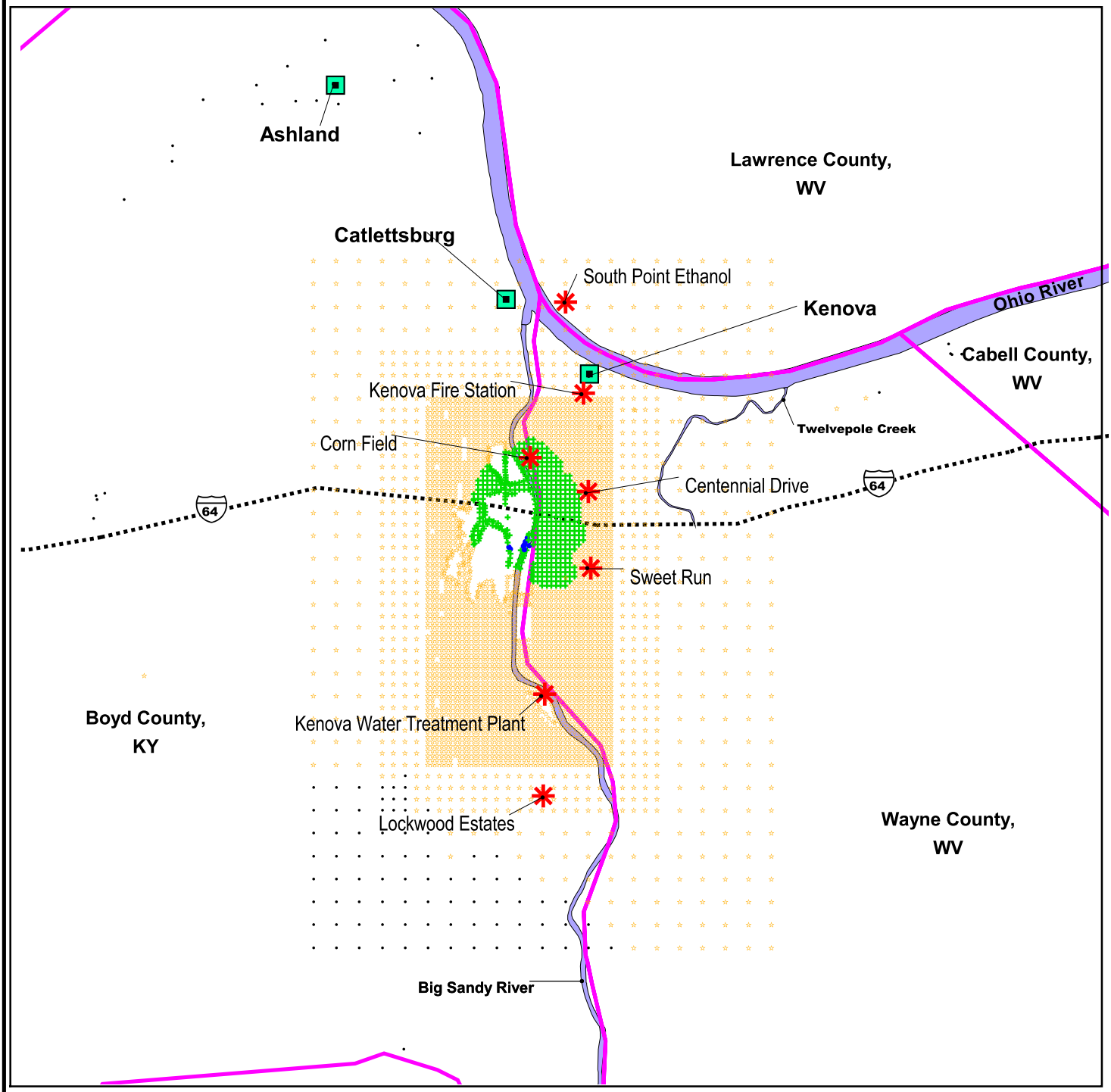
Centennial Drive (Special Receptor 37)
Corn Field (Special Receptor 35)
Kenova Fire Station (Special Receptor 34)
Kenova Water Works (Special Receptor 39)
Lockwood Estates (Special Receptor 38)
Sweet Run (Special Receptor 36)
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-12
Cancer Risks for the Lifetime Resident Receptor
Task 1 Data, RME

Receptor - Figure 2-12
Prepared by: Gannett Fleming, Inc.



- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

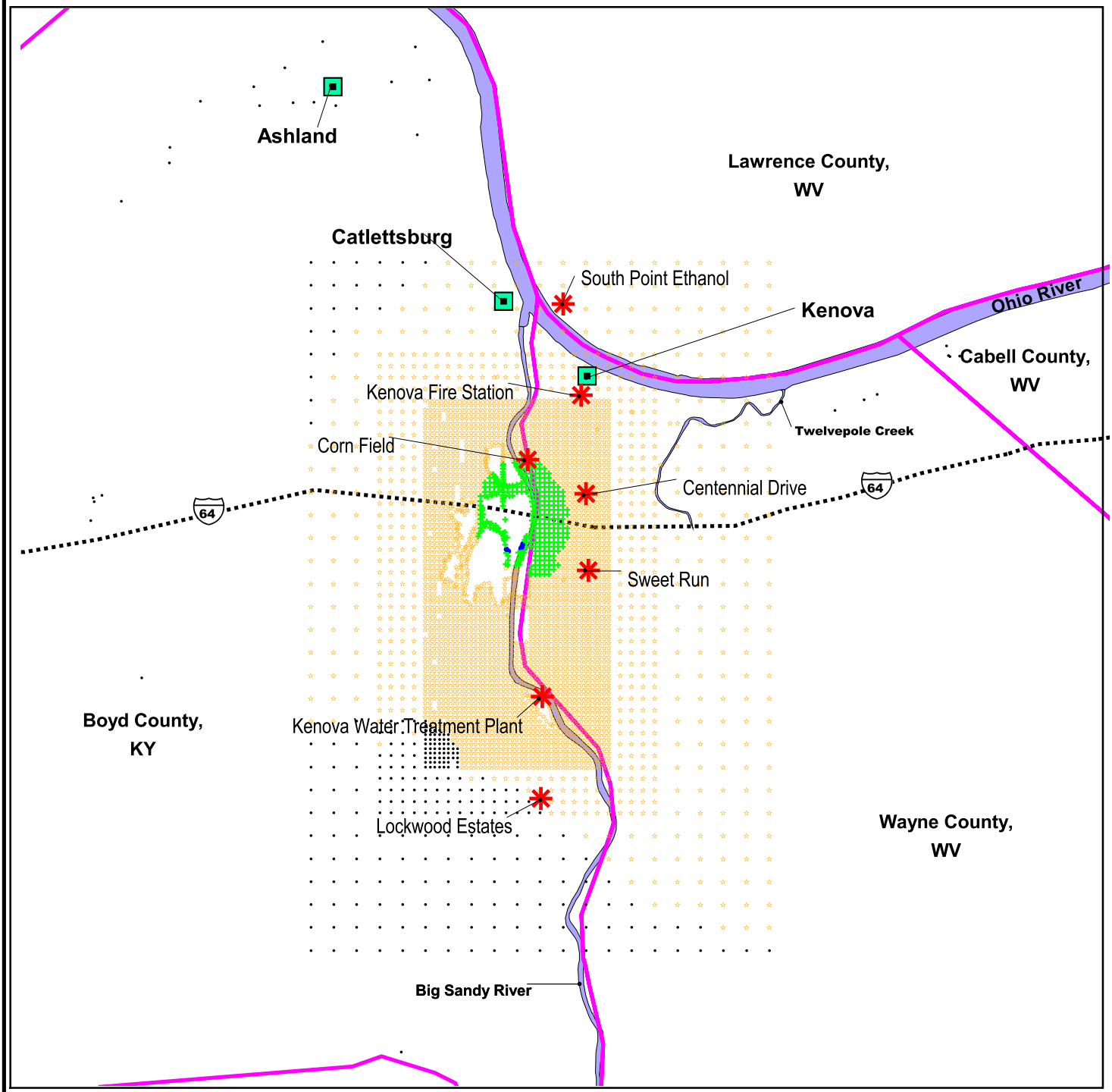
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-13
Cancer Risks for the Adult Resident Receptor Task 1 Data, RME

Receptor - Figure 2-13
Prepared by: Gannett Fleming, Inc.



- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W
E
S

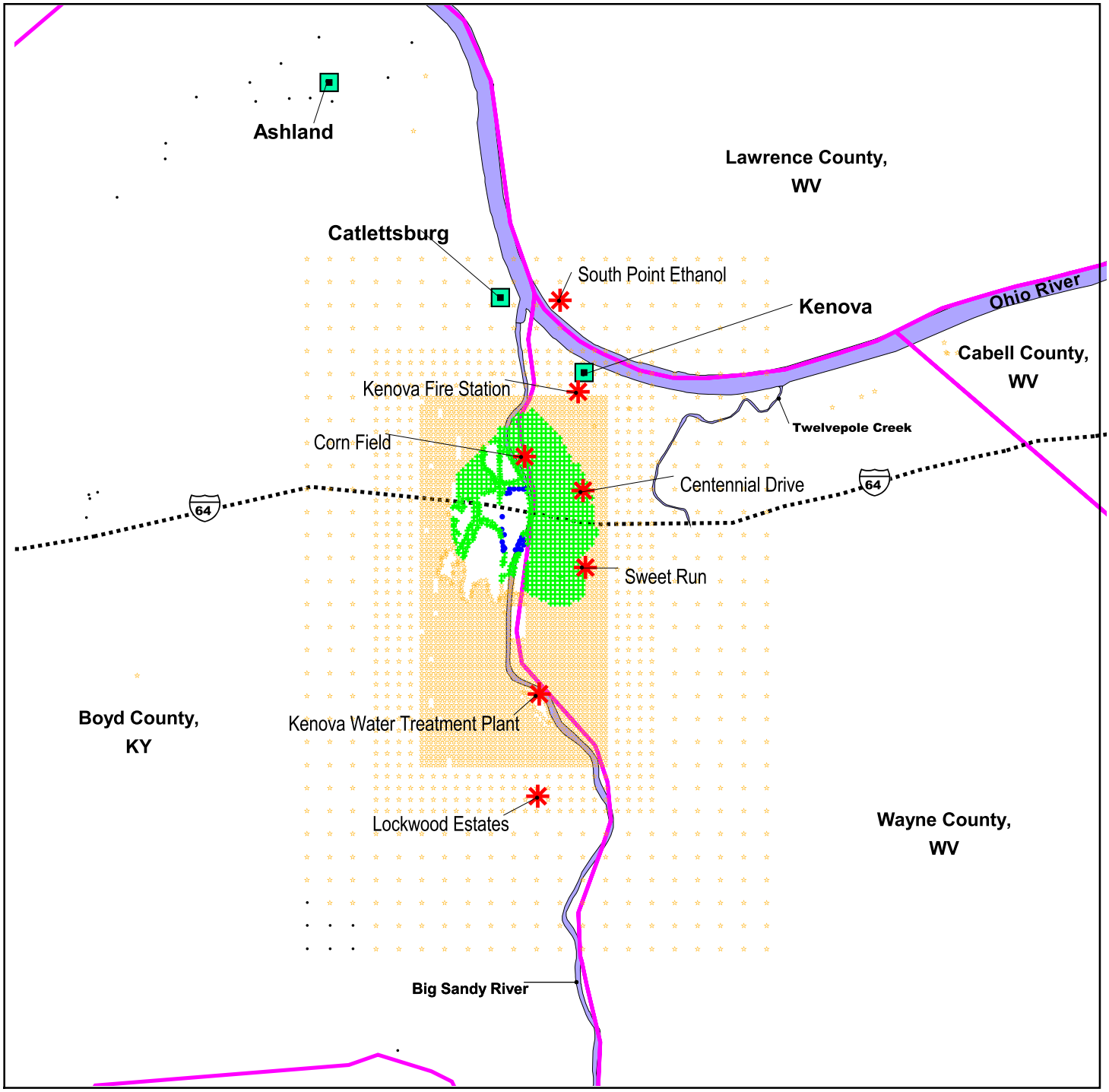
Centennial Drive (Special Receptor 37)
Corn Field (Special Receptor 35)
Kenova Fire Station (Special Receptor 34)
Kenova Water Works (Special Receptor 39)
Lockwood Estates (Special Receptor 38)
Sweet Run (Special Receptor 36)
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-14
Cancer Risks for the
Child Resident Receptor
Task 1 Data, RME

Receptor - Figure 2-14
Prepared by: Gannett Fleming, Inc.



- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W E
S

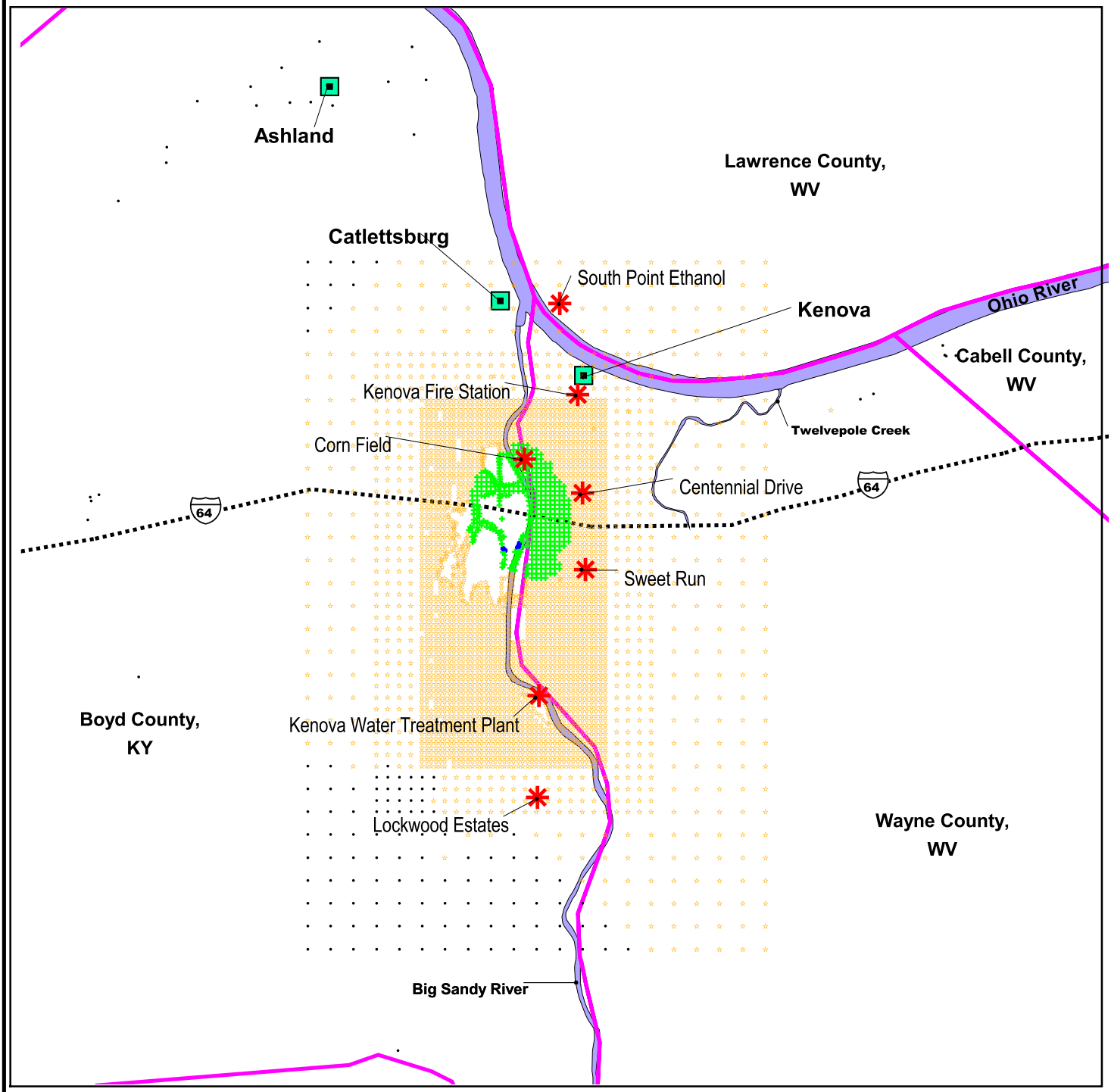
Centennial Drive (Special Receptor 37)
Corn Field (Special Receptor 35)
Kenova Fire Station (Special Receptor 34)
Kenova Water Works (Special Receptor 39)
Lockwood Estates (Special Receptor 38)
Sweet Run (Special Receptor 36)
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-15
Cancer Risks for the
Lifetime Resident Receptor
Task 3 Data, RME

Receptor - Figure 2-15
Prepared by: Gannett Fleming, Inc.



- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W
E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

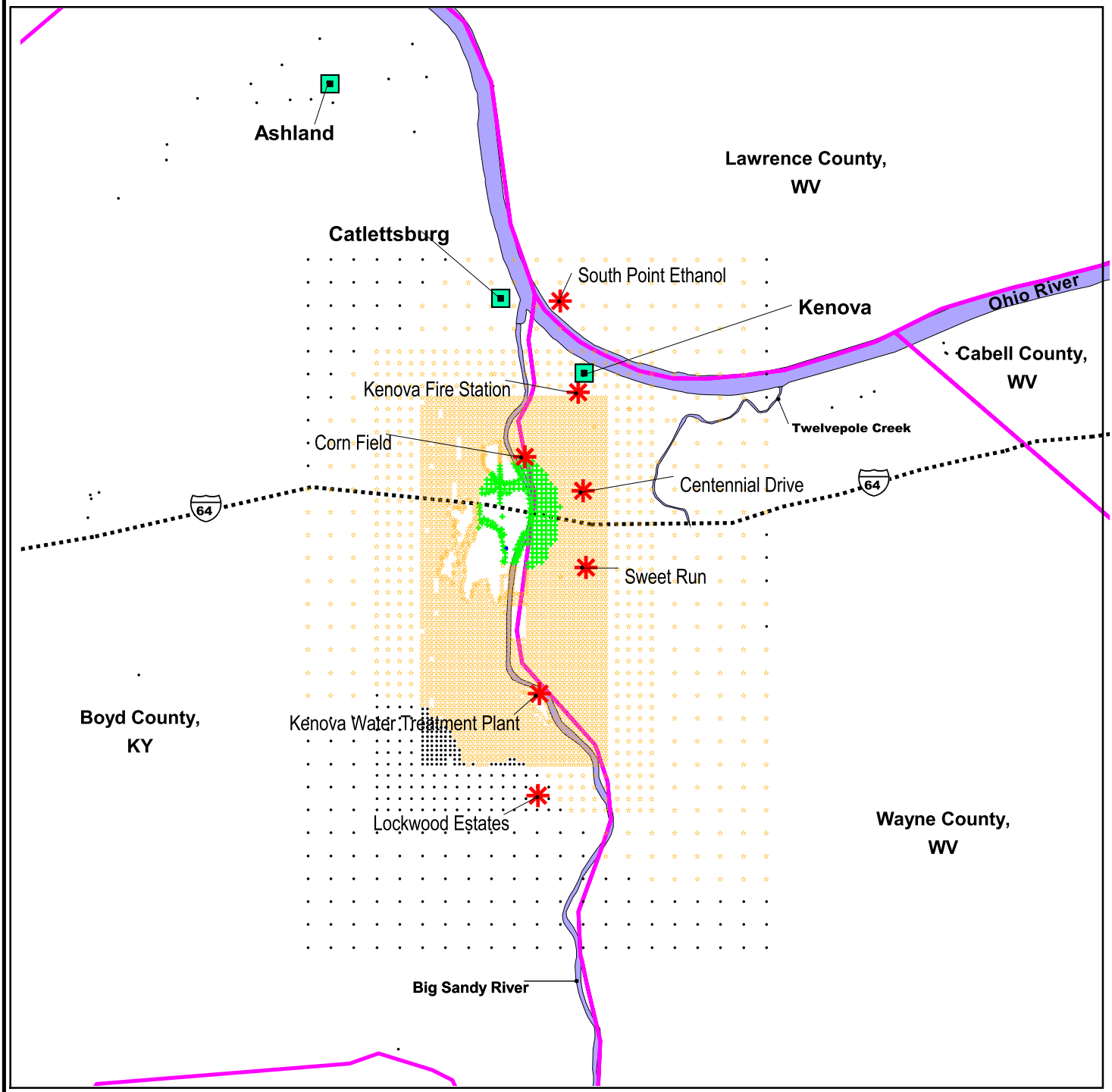
South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 2-16
Cancer Risks for the
Adult Resident Receptor
Task 3 Data, RME

Receptor - Figure 2-16
Prepared by: Gannett Fleming, Inc.



- Risks are greater than or equal to 1E-4
- Risks are between 1E-4 and 1E-5
- Risks are between 1E-5 and 1E-6
- Risks are less than 1E-6

Political Boundaries
Highways

N
W
E
S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

South Point Ethanol (Mobile lab only, not a special receptor)

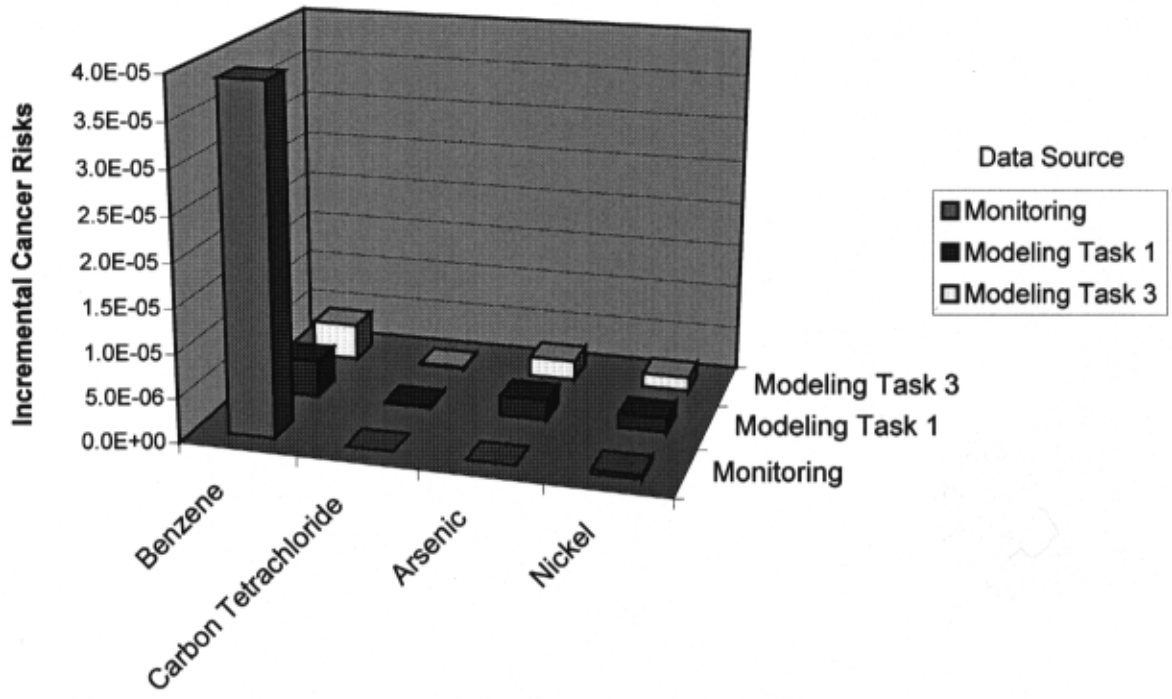
Scale = 1:125,000

4 0 4 Miles

Figure 2-17
Cancer Risks for the
Child Resident Receptor
Task 3 Data, RME

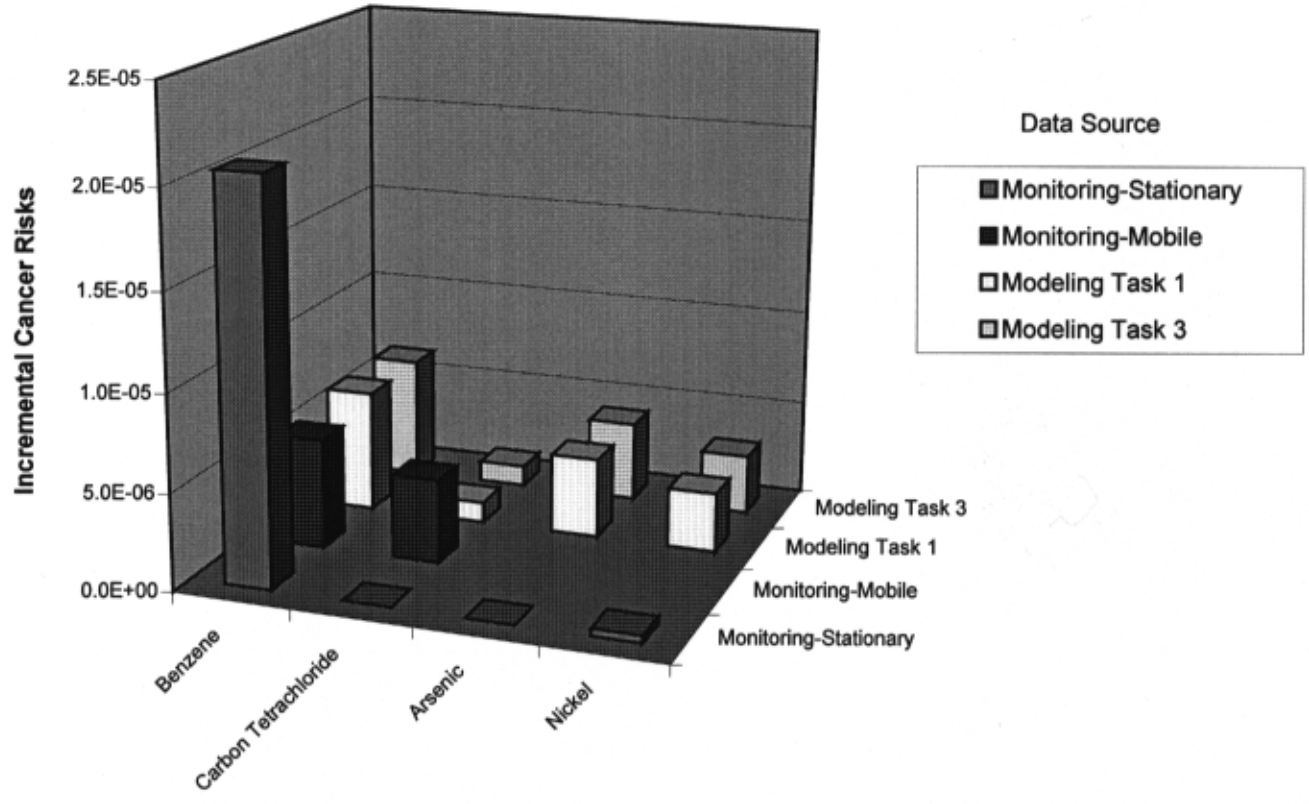
Receptor - Figure 2-17
Prepared by: Gannett Fleming, Inc.

Figure 2-18. Centannial Drive, Cancer Risks for Lifetime Receptor



GraphdataLIFETIMECancer.xls, CD,10/18/00

Figure 2-19. Corn Field, Cancer Risks for Lifetime Receptor



GraphdataLIFETIMECancer.xls, CF,10/18/00

Figure 2-20. Kenova Fire Station, Cancer Risks for Lifetime Receptor

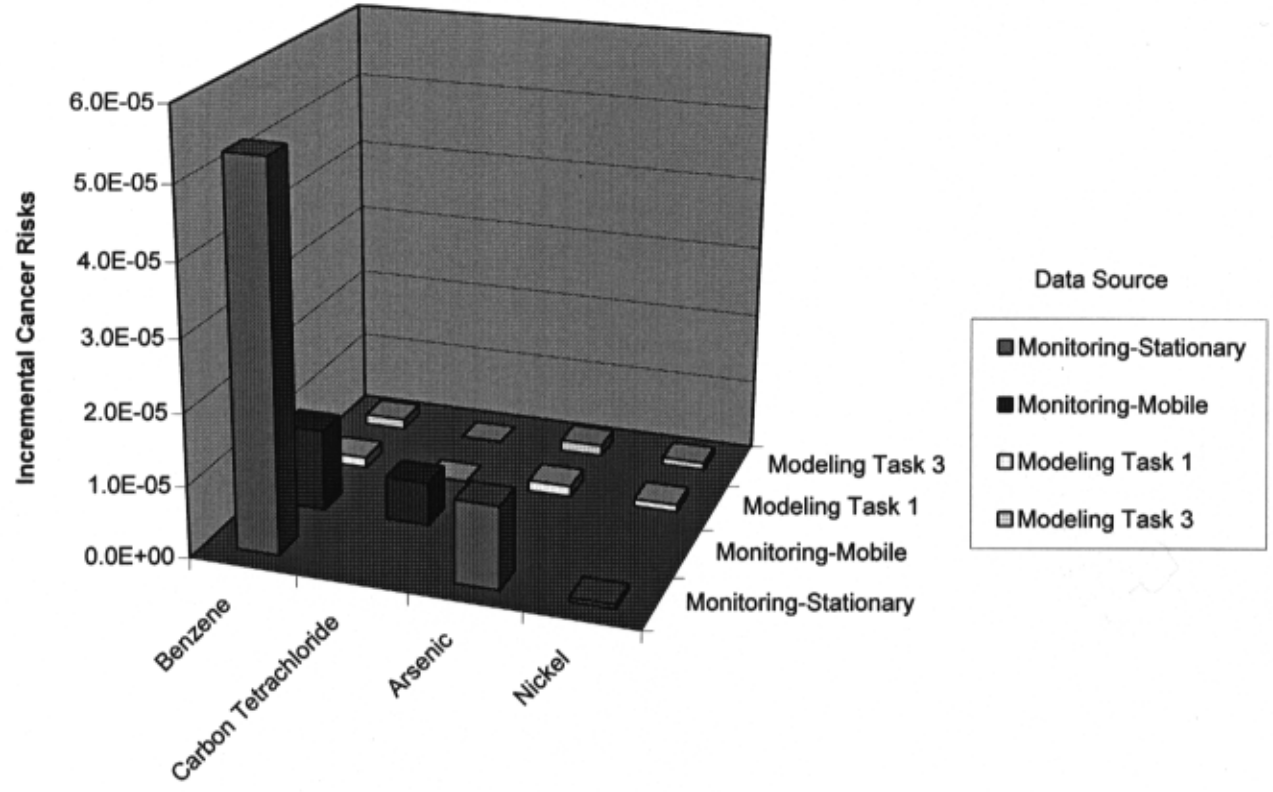
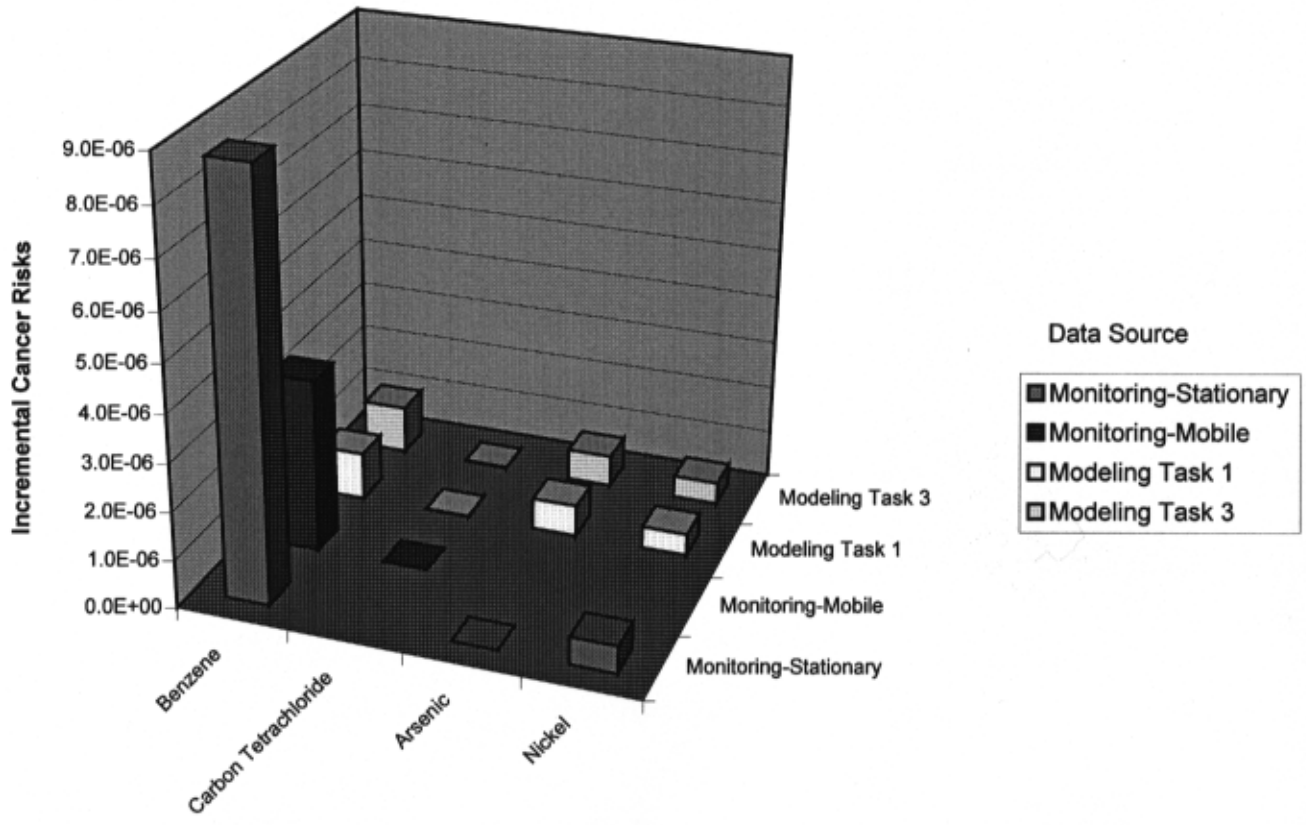
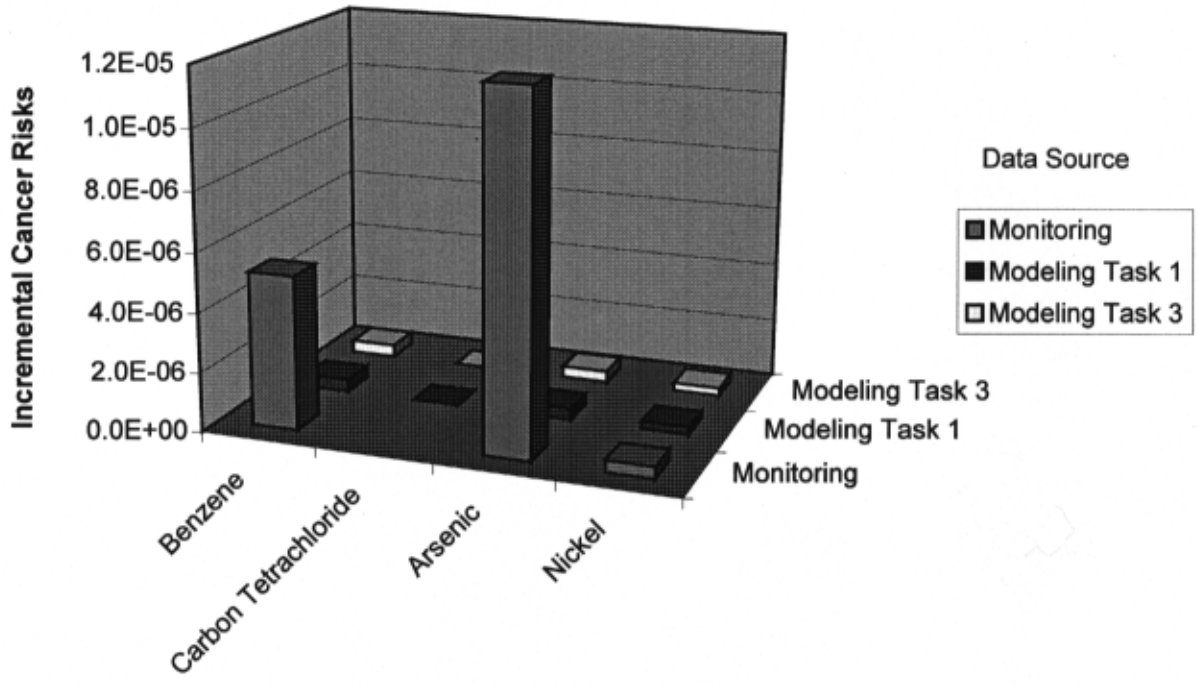


Figure 2-21. Kenova Water Works, Cancer Risks For Lifetime Receptor



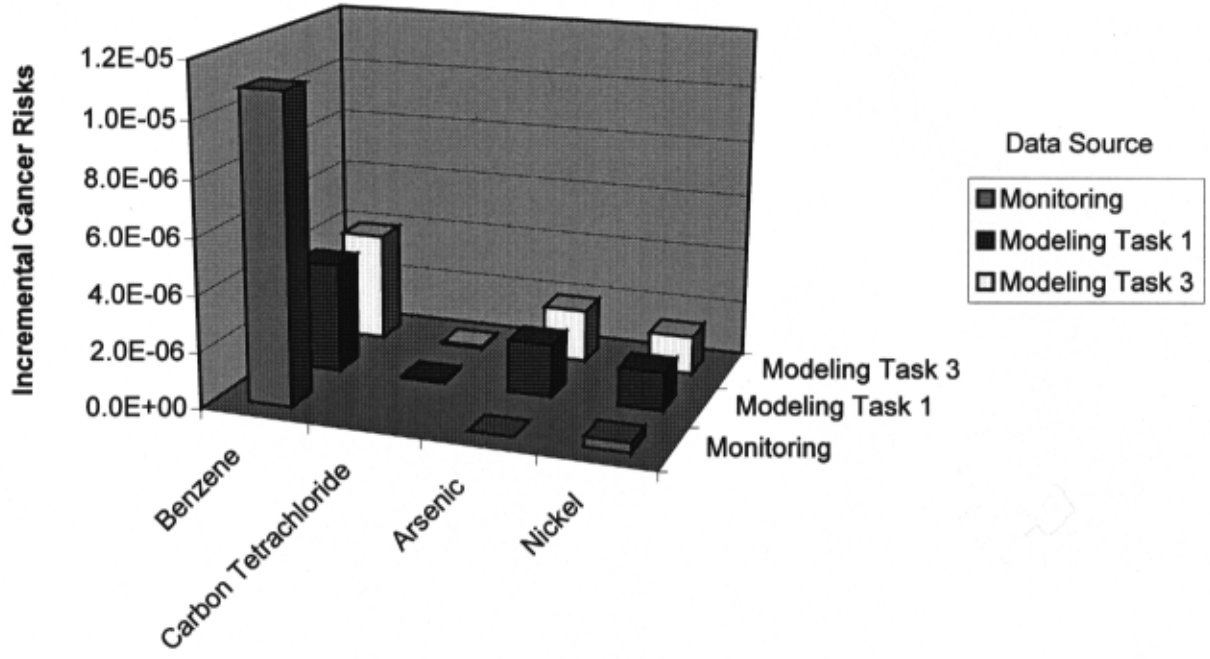
GraphdataLIFETIMECancer.xls, KW,10/18/00

Figure 2-22. Lockwood Estates, Cancer Risks for Lifetime Receptors

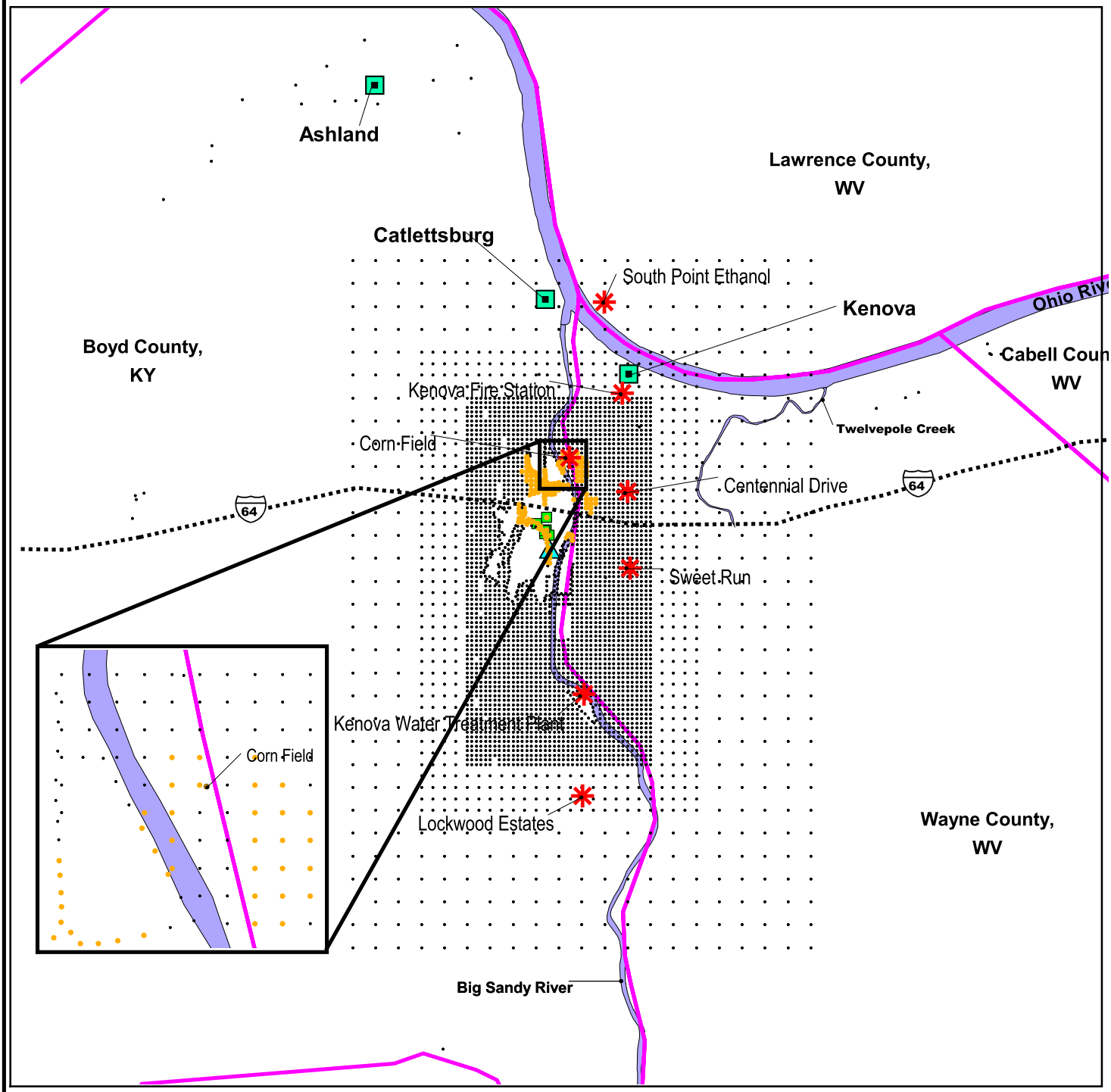


GraphdataLIFETIMECancer.xls, LW,10/18/00

Figure 2-23. Sweet Run, Cancer Risks for Lifetime Receptor



GraphdataLIFETIMECancer.xls, SR,10/18/00



Arsenic

Benzene

Nickel

Political Boundaries

Highways

N

W E

S

Centennial Drive (Special Receptor 37)

Corn Field (Special Receptor 35)

Kenova Fire Station (Special Receptor 34)

Kenova Water Works (Special Receptor 39)

Lockwood Estates (Special Receptor 38)

Sweet Run (Special Receptor 36)

South Point Ethanol (Mobile lab only, not a special receptor)

Scale = 1:125,000

4 0 4 Miles

Figure 3-1
Comparison of Monitoring and Modeling Results
Acute Exceedance
Task 2, Episode 10, 24 Hour

Receptor - Figure 3-1
Prepared by: Gannett Fleming, Inc.